FACTORY

BETTER PRODUCTION AND MAINTENANCE THROUGH BETTER MANAGEMENT

atercolor painting: Spring comes to Manning, Maxwell & Moore's big plant at Stratford, Conn.

JUNE 1959

PRICE ONE DOLLAR

A McGRAW-HILL PUBLICATION

MODERNIZING TO CUT COST . . p. 74

How "new way" ideas revolutionize a plant

HITTING HANDLING COSTS IN MAINTENANCE . . . . . p. 94

HOW TO STAFF UP A PLANT . . . . . p. 194

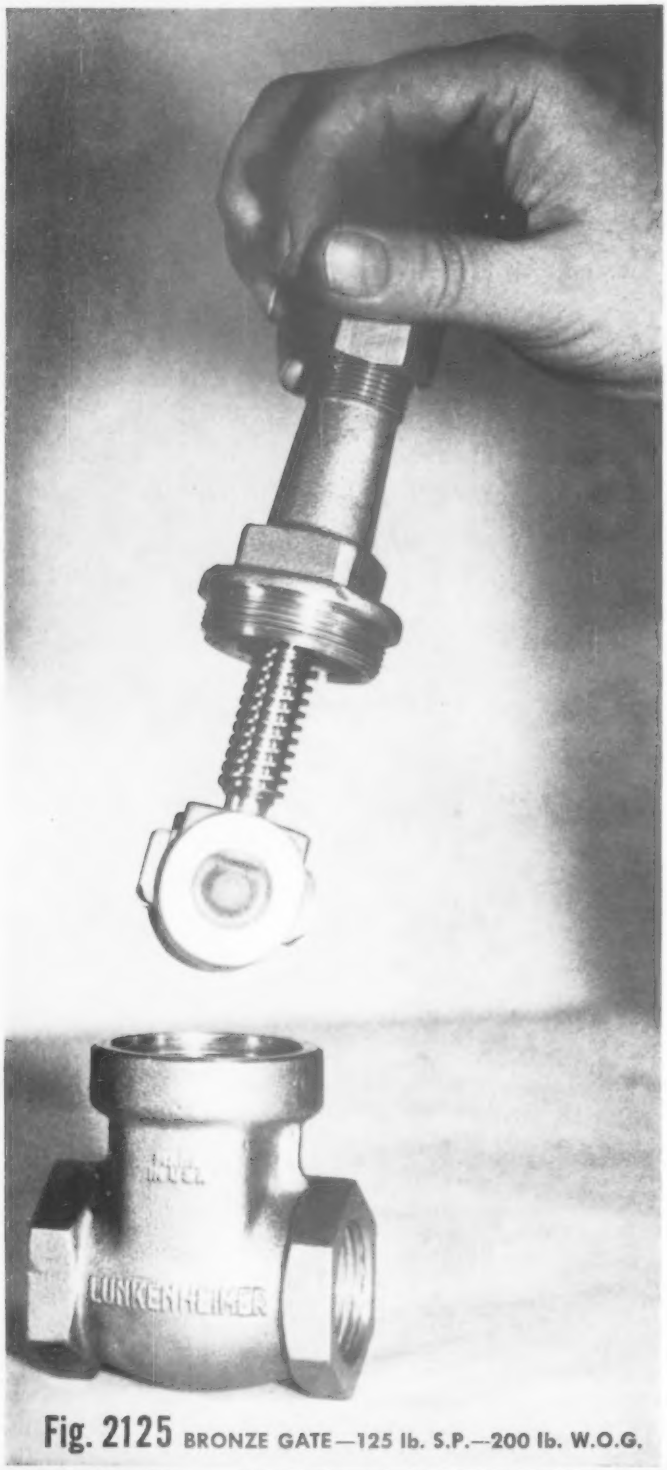


Fig. 2125 BRONZE GATE—125 lb. S.P.—200 lb. W.O.G.

SEE WHY LUNKENHEIMER BRONZE GATE VALVES CUT MAINTENANCE

What you pay to maintain a valve can exceed its original cost many times over. That's why it pays to examine the maintenance-saving features of Lunkenheimer Bronze Gate Valves.

Stems are made of Stemalloy®, an exclusive Lunkenheimer alloy that assures longer stem thread life. Integral seats are precision tapered to insure perfect seating. Discs are compounded for long, wear-resistant service, machined to a high finish for smooth, trouble-free operation.

Let your Lunkenheimer Distributor show you the maintenance-saving features of Lunkenheimer Bronze Gate Valves and why you can't find the cost of a valve on a price list... Or write The Lunkenheimer Co., Cincinnati 14, Ohio.

LUNKENHEIMER QUALITY

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

L-7804

For more facts circle 446 on READER SERVICE CARD

B.F.Goodrich

V belt briefs

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

The right way to install and run-in V belts

To get the most possible life out of a set of V belts you've got to install them and run them in properly:

To install V belts:

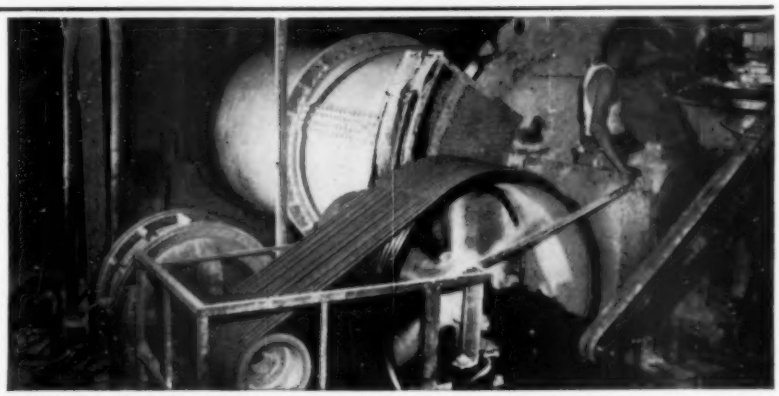
1. Move driver unit toward driven machine so that belts may be placed in sheave grooves by hand.
2. Work belt slack to top side of drive.
3. Move driver unit back into position, eliminating all belt sag.
4. Check sheave alignment.

To run-in V belts:

1. Start unit and operate long enough to permit belts to properly seat in grooves.
2. Stop unit. Adjust centers as necessary until all belts have proper tension.
3. Review adjustment from 24 hours to 48 hours after drive is in operation. This is important, for new belts stretch slightly and seat in grooves before reaching their working lengths.

It pays to keep belts stored properly

V belts should be stored in a cool, clean, dry place. Avoid heat and direct sunlight. Do not hang on nails or other small objects which might cause a sharp bend or tension that would result in a permanent set in V belt. Oldest belts should be used first to keep fresh stock. Matched belts should be banded together so they don't become separated.

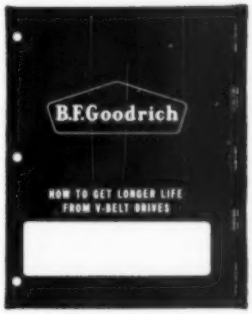


BELTS BOIL IN HOT MILL SAND — *The V belts driving this ball mill help grind hot sand, heated to 260°, to a fluffy powder used for fine glass, pottery, cosmetics. Ordinary V belts were lasting one to two years. B.F.Goodrich Grommet belts replaced them, have lasted over five years. Grommet belts stay cooler because they generate less internal heat and are made of a rubber that takes higher temperatures.*

What caused this V belt failure?

Answer: Prematurely worn sides are caused by grit, dirt or any such abrasive contact. Misalignment often causes wear on one side only. To prevent, align the sheaves, checking with straight-edge or cord. Keep belts and sheave grooves clean.

B.F.Goodrich V belt manual



Your B.F.Goodrich distributor has a new maintenance manual that tells you how to get longer life from your V-belt drives. Its 12 illustrated pages contain information on how V belts work, how to select V belts that fit, how to install, how to keep them running, and how to spot trouble.

Take a look inside with this X-ray of a Grommet belt

This model of a B.F.Goodrich Grommet belt was made of a transparent, flexible material so that you can see its grommet construction. The two endless loops you see are grommets, the load-carrying members of the B.F.Goodrich belt. These are made by winding heavy cord on itself to make an endless cord grommet.

In the actual belt, these grommets float in a bed of solid rubber. You can *see* why every part of the belt is equally flexible—there are no stiff plies to resist bending. Most cord failures occur where cords overlap. But in the B.F.Goodrich Grommet belt with endless cord construction this cause of failure is eliminated.

Ask a factory-trained specialist

For help in selecting V belts for any kind of service, call the man who is a specialist in V belts—your B.F.Goodrich distributor. He can help you cut costs by getting longer life from your V belt drives. *B.F.Goodrich Industrial Products Company, Dept. M-607, Akron 18, Ohio.*

B.F.Goodrich V belts

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THE MAGAZINE OF PLANT OPERATING MANAGEMENT

Edited exclusively for the men with management responsibility for production and maintenance in the manufacturing industries

PROBLEM-SOLVING GUIDE

THIS SIMPLE FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve current operating problems. Here's how it works:

1. All major articles and many short items are classified according to a functional code system (below). Codes cover basic operating responsibilities.

2. Where applicable, articles are also coded (see numbers in parentheses) to show secondary or closely related topics.

3. To use, cut up the items below. Paste them on 3x5-in. cards and file by code number. To cross-index, copy the information on a second card, and file by secondary code.

For ways to use this tool, plus an outline for a complete decimal filing system (DFS), circle DFS in upper right corner of Reader Service Card, next to back cover.

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1.0 Plant Maintenance and Engineering

1.1 Management and Practices

1.2 Buildings and Yards

1.3 Services and Facilities

1.4 Electrical Services

2.0 Production

2.1 Management

2.2 Production Controls and Systems

2.3 Methods and Technology

2.4 Materials Handling and Plant Layout

3.0 Plant Management

3.1 Organization and Policies

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6 Reasons Why ELPAR Trucks Are Your Best Buy!

When you make a value analysis of ELPAR trucks, consider these important points . . .

1. ELPAR trucks are classed as top quality yet they cost less to operate . . . are more dependable . . . last longer.
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TWICE THE LIFE... ONE-THIRD THE OPERATING COST

For more facts Circle 449 on Reader Service Card

Dust trap that snared thousand-dollar savings

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Then a Goodyear Distributor suggested PLIOTRON super-filters. In short order, the publisher knew he had virtually eliminated his soilage problem. That meant a savings of thousands of dollars on his books.

And, at last report, the PLIOTRON filters had *served 2½ years—almost 7 times their predecessors*—and looked like they'd last a lifetime.

Would filters like these solve a problem for you? PLIOTRON super-filters—up to 5 times as effective at trapping fine dust – are proved money savers the country over. For this full story, see your PLIOTRON Distributor—or write:

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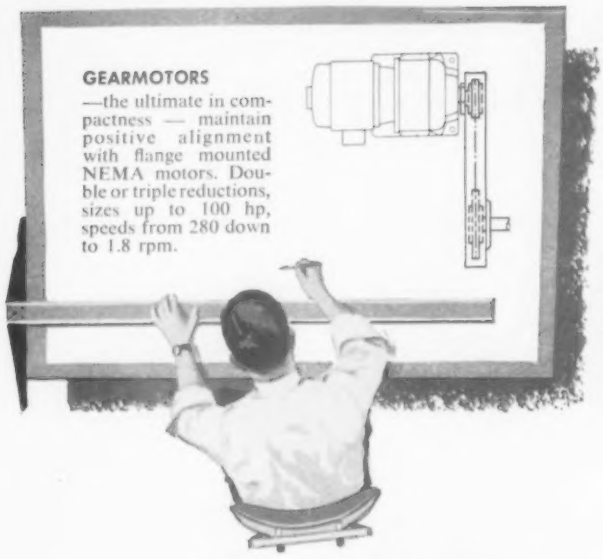
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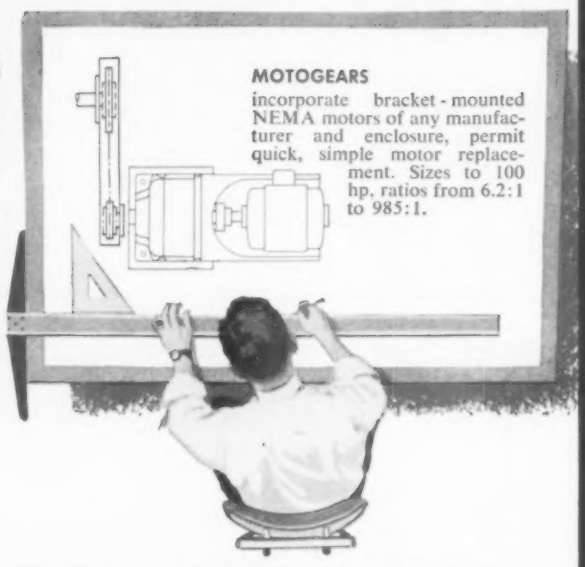
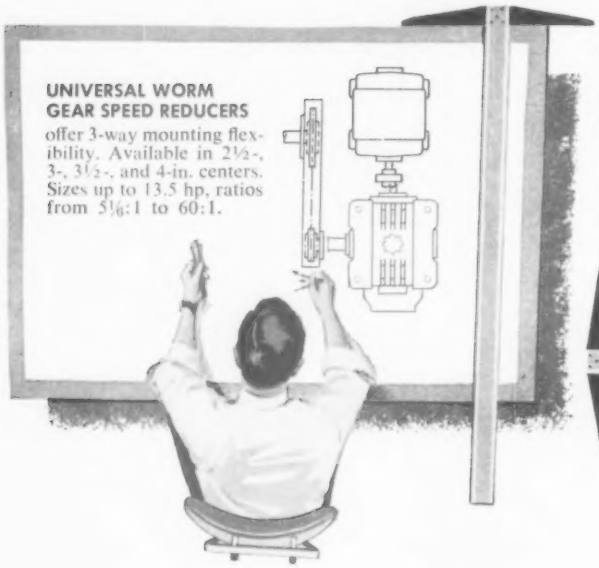

MOTOGEARS
incorporate bracket-mounted NEMA motors of any manufacturer and enclosure, permit quick, simple motor replacement. Sizes to 100 hp, ratios from 6.2:1 to 985:1.

It's industry's only complete line—

don't limit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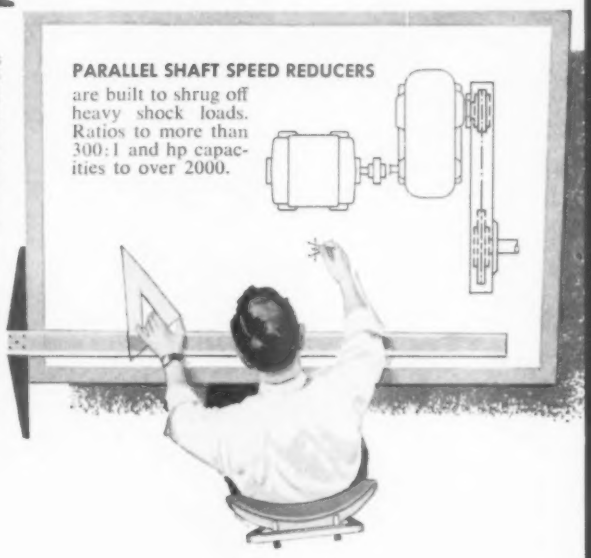
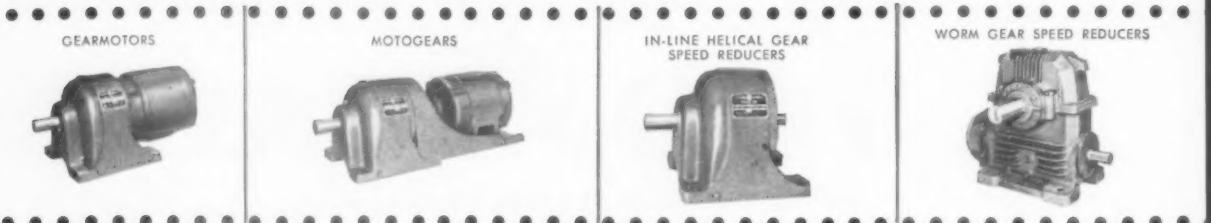

PARALLEL SHAFT SPEED REDUCERS
are built to shrug off heavy shock loads. Ratios to more than 300:1 and hp capacities to over 2000.



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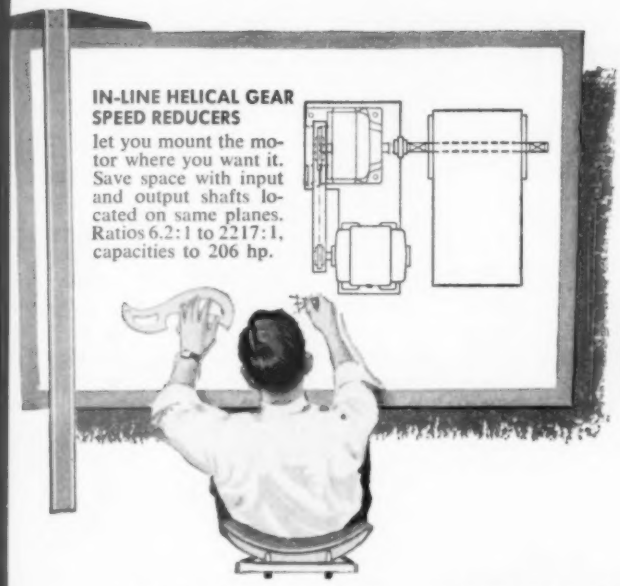
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SPEED REDUCERS
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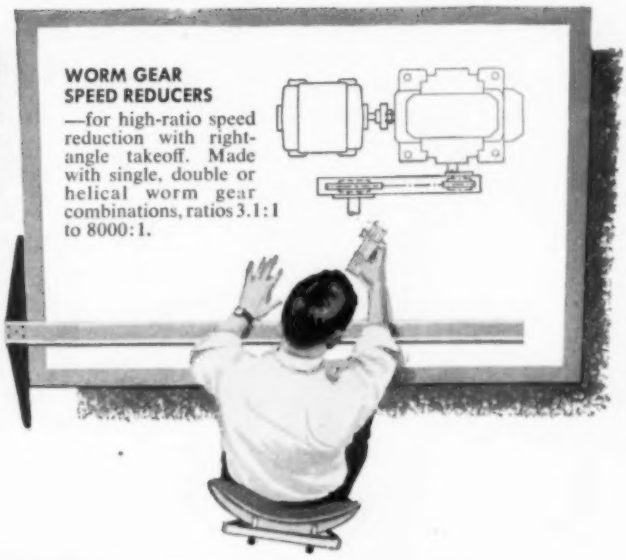
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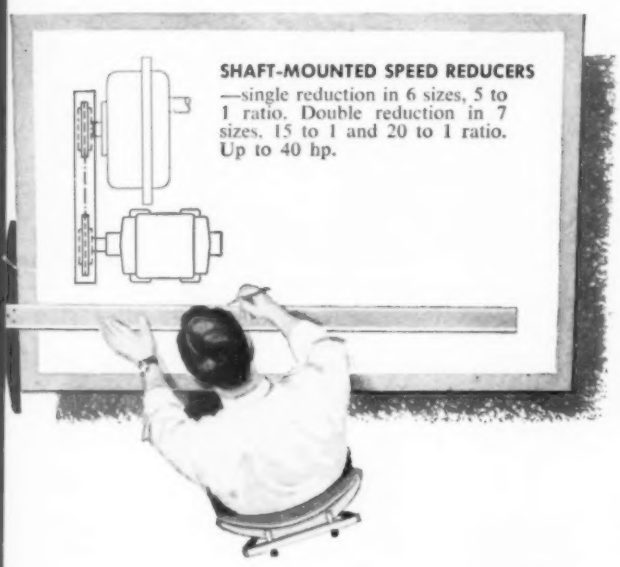
—for high-ratio speed reduction with right-angle takeoff. Made with single, double or helical worm gear combinations, ratios 3.1:1 to 8000:1.

that's why LINK-BELT speed reducers

your layout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—single reduction in 6 sizes, 5 to 1 ratio. Double reduction in 7 sizes, 15 to 1 and 20 to 1 ratio. Up to 40 hp.

Yes, you can plan with full freedom when you rely on LINK-BELT. *Seven* basic types of speed reducers—each in a wide range of sizes and ratios—give you complete flexibility in drive layout. It's easy to select the one that *exactly* meets your requirements for ratio, space, shaft position, shock loading and other specific factors.

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For full facts on Link-Belt's comprehensive line of speed reducers—including selection and features data—get in touch with your nearest Link-Belt office or authorized stock-carrying distributor.

LINK-BELT

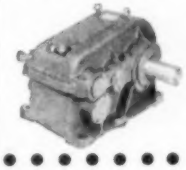
SPEED REDUCERS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

UNIVERSAL WORM GEAR SPEED REDUCERS

SHAFT-MOUNTED SPEED REDUCERS

PARALLEL SHAFT SPEED REDUCERS



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Distributors, backed by 16 warehouses strategically located throughout the United States, assure immediate availability of all popular sizes of Link-Belt speed reducers.

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Faultless
Casters

L900

DOUBLE BALL BEARING SWIVEL
MEDIUM DUTY

CUT YOUR HANDLING COSTS 3 WAYS

Faultless Casters

SUPERIOR DESIGN FEATURES

1. **CORRUGATED TOP PLATE** . . . fully hardened to give added strength. Slotted mounting hole spacing permits easy attachment.
2. **MAIN LOAD BEARING** . . . consists of 21 hardened, polished balls (⅜" dia.) rolling in large dia. hardened, lubricated raceway permanently attached to caster horn to assure perfect alignment.
3. **LOWER THRUST BEARING** . . . contains 10 hardened steel balls (5/16" dia.). Hardened raceway is machined from bar stock. Ball retainer is hardened formed steel.
4. **EXTRA-LARGE DIAMETER KINGPIN** . . . assures bonus strength in this caster.
5. **CLOSE FITTING, FORMED STEEL CUP** . . . protects thrust bearing from foreign matter. Holds lubricants in bearings, keeps floor clean.
6. **HEAVY GAUGE, FORMED STEEL HORN** . . . easily absorbs highest rated loads and thrust.
7. **FULL SELECTION OF WHEELS** . . . for all types of floors and operating conditions. Bolt and nut axles permit quick wheel replacement when needed.

SERIES L9700 RIGID PLATE CASTER Wheel types and sizes, load capacities and overall heights to match L900 Swivel Plate Caster.

ASK YOUR DISTRIBUTOR! Your Faultless Industrial Distributor will be glad to serve as your expert on casters and wheels. He stocks Faultless Casters and is prepared to offer "plus value" by recommending the right type, load capacity and wheels to suit your requirements. He is listed in your phone directory under "Casters."

FREE! SEND FOR ILLUSTRATED LITERATURE

Faultless Caster Corporation
Evansville 7, Indiana

Send me Free L900 Medium Duty Caster information.

Name_____

Firm_____

Address_____

City_____ State_____

FACTORY LETTERS

HIGH INTEREST

Sir:

On page 124 of the March 1959 issue of FACTORY there is an article pertaining to "Low-Cost Pallets for Heavy Loads." We would appreciate your giving us more information on these pallets.

Howard C. Lee
Plant Manager, McLarens Limited
Vancouver 12, Canada

Sir:

Would you please send me additional information about low-cost pallets or tell me whom to contact?

J. D. Myers
Parkersburg, W. Va.

Sir:

With regard to the article on page 124 of your March issue, we would appreciate more information on low-cost pallets, developed by the Calaveras Cement Company.

Francis J. Cashin
Secretary, Huck Products Corp.
New York 36

Sir:

Please send us a brochure and complete information on the low-cost pallets for heavy loads.

Seymour Silverman
Modern Maid Floor Products, Inc.
Jamaica 12, N. Y.

► We are delighted that this short item on low-cost pallets has stimulated so many inquiries. These units

Turn the page

FACTORY

June 1959 Vol. 117, No. 6

A consolidation of Factory Management and Maintenance and Factory and Industrial Management, including Factory, and Maintenance Engineering. Published monthly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder.

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It prevents costly delays by getting bulky materials into storage. It keeps heavy parts and products moving through all departments in time for scheduled production. It hustles big loads to platform, freight cars and trailers for on-time shipping. "Beating the clock" . . . preventing peak load tie-ups . . . is what husky Gerlinger fork lift trucks are *job-proved* to do best!

Let us send you latest on-the-job data. Ask for Certified Job Studies applying to your own business—and the new Gerlinger Specification Folder *GSS*. Write Towmotor Corporation, Cleveland 10, Ohio or Gerlinger Carrier Company, Dallas, Oregon.*

TOWMOTOR ®
THE ONE-MAN-GANG

-GERLINGER LEADERS FOR 40 YEARS IN BUILDING FORK LIFT TRUCKS, CARRIERS AND TRACTORS

*Gerlinger Carrier Co. is a subsidiary of Towmotor Corporation

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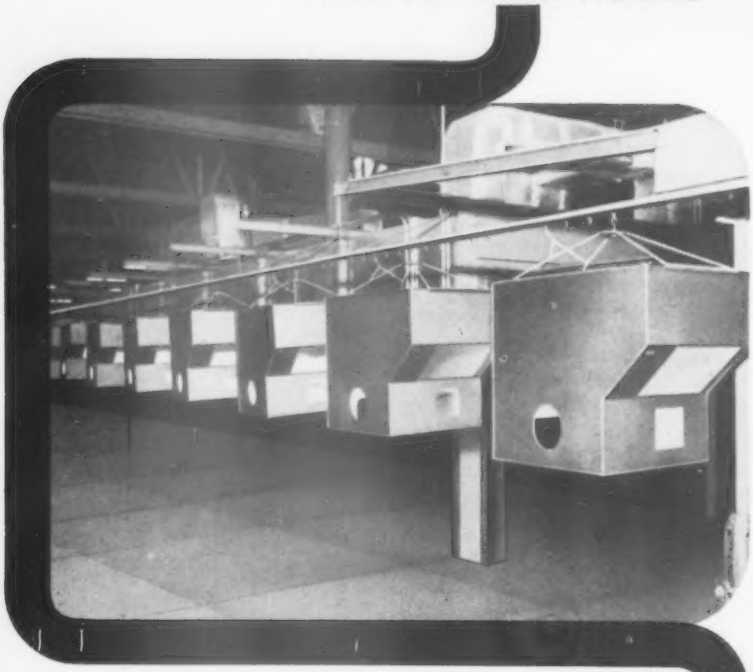
REDUCE MAN HOURS



BOOST PRODUCTION!

A large Western manufacturer of industrial furnaces has proven again the increased production and tangible savings made possible through automation of in-process work cycles. This fully integrated Chainveyor overhead conveyor system completely eliminates intermediate handling through spray painting and baking sequences — thus cutting overhead and increasing production.

Almost every plant operation can benefit from the unusual versatility of Chainveyor systems when applied to finishing, assembly, fabricating, inspection, and overhead storage.

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were originally developed by the engineering staff of Calaveras Cement Company (San Francisco). The company has already applied for patents and now plans to distribute the pallets through a newly formed subsidiary, Calco Supply Company, San Francisco.—ED.

QUALIFIED PRAISE

Sir:

Our cost control article in the March issue (page 64) looks very good. It is effectively and attractively arranged, but I saw three mistakes in the text. There was $4 instead of $5 at the bottom of page 64. You also used the word "worker" (on page 67) that I never use. In addition, the word "accurate" (on page 68) that I always modify. I feel there is no such thing as accuracy outside of arithmetic—only degrees of it.

Phil Carroll
Society for Advancement of Management
Maplewood, N. J.

► Sorry we bollixed the dollar figure. But we're glad you like the article in general. We have found it advisable to use the word "worker" because our readers know exactly what we mean. As for the way in which we use the word "accurate"—we're still checking the dictionary in an attempt to determine whether we're right or wrong.—ED.

WORK SAMPLING

Sir:

I follow with great interest your articles on work sampling and I am particularly interested in the phases of its application to hospital problems. Are further details available on Harper Hospital's experiment (Detroit)?

Frank A. Sorad
Methods Analyst
Saint Luke's Hospital, Cleveland 4

► Our information on the work sampling done at Harper Hospital is very sketchy. There was a brief reference in Mr. C. L. Brisley's work sampling article in July 1952 issue of FACTORY (page 84). The program was started with the help of the

For more facts Circle 454 on Reader Service Card

now . . . handy smaller size . . . new features

Tote Boxes

by WEAR·EVER

Smooth, rounded, easy-to-clean corners
#24 Over-all Size: 23⅞" x 17-1/16" x 10⅜"
Exclusive Open Bead design
#24 available without handles to fit Cres-Cor Pan Rack
Stack when filled
Strong, smooth one-piece handle
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Dolly available for #35 shown at left.

You asked for it . . . a smaller version of the famous Wear-Ever #35 Tote Box. It's our new #24, shown at top in the above illustration, and it's available *now*.

We've designed it particularly for you whose needs call for a lighter, smaller, easier-to-handle container. It is available without handles, to fit perfectly in a Cres-Cor pan rack.

This new box incorporates the same quality construction features as our standard size box—special extra hard wrought Wear-Ever Aluminum Alloy, sanitary open bead and extra strong, double-embossed bottom.

Like its big brother, shown in the smaller photo, this new box stacks when full, nests when empty and is available with your identifying imprint on side or end, if desired.

For full information on our complete line of food handling items, call your local Wear-Ever man, or send coupon below.

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WEAR-EVER BLDG., NEW KENSINGTON, PA.

W. Ever Aluminum Inc.
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GENTLEMEN: *I'd like to know more about your Tote Boxes and other handling equipment.*

☐ Send me your catalog. ☐ Have your representative see me.

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TITLE .....

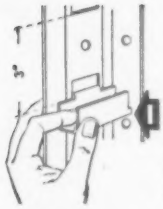
Fill in, clip to your letterhead and mail today.

NEW IDEA! *Wear-Ever's new Nickel Scouring Cloth. Won't scratch, won't mar, far outlasts ordinary scouring cloths. At your dealer's.*

yes, gentlemen, with

"4" BORROUGHS STEEL SHELVING does the trick!

you need only 4 pieces, not 8, 16 or 28 pieces, to assemble a shelf



Insert 4 shelf support brackets . . . no fumbling with studs, bolts, nuts or lock washers.

and then

Tilt shelf into support brackets . . . and shelf is ready for loading.

. . . and there you have the plain and simple reason why Borroughs Steel Shelving is the most simple, most flexible, most rapidly assembled shelving on the market. Think of being able to install or rearrange a shelf in a matter of seconds! Think of being able to install all shelves in a unit with only 2 bolts and 2 nuts (both in the top shelf)! Think of being able to assemble a complete unit without any special tools! And for good measure — any unit or shelf can be moved independently. More facts for the asking!

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OF KALAMAZOO

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Detroit Chapter of the Society for the Advancement of Management. Therefore, I suggest you contact the editor of "Advanced Management," SAM's monthly magazine, or the general manager at Harper Hospital, for additional information.—ED.

OUR MISTAKE

Sir:

I take exception to an item in the March 1959 isue of FACTORY (page 121). It states Alcoa's breakdown mill is "the widest in the industry." We here at Ravenswood have in operation a reversing breakdown mill that is 168 inches wide, and it is my understanding that Reynolds Metals will soon have one that is 170 inches wide.

A. B. Lindley
Maintenance Superintendent
Kaiser Aluminum & Chemical Corp.
Ravenswood, W. Va.

► Many thanks for your letter. Sorry we refered to Alcoa's 160-in. breakdown mill as the "widest in the industry." However, I believe we were correct in stating that this is the first electronically controlled rolling mill in the light metal industry.—ED.

INFORMATION WANTED

Sir:

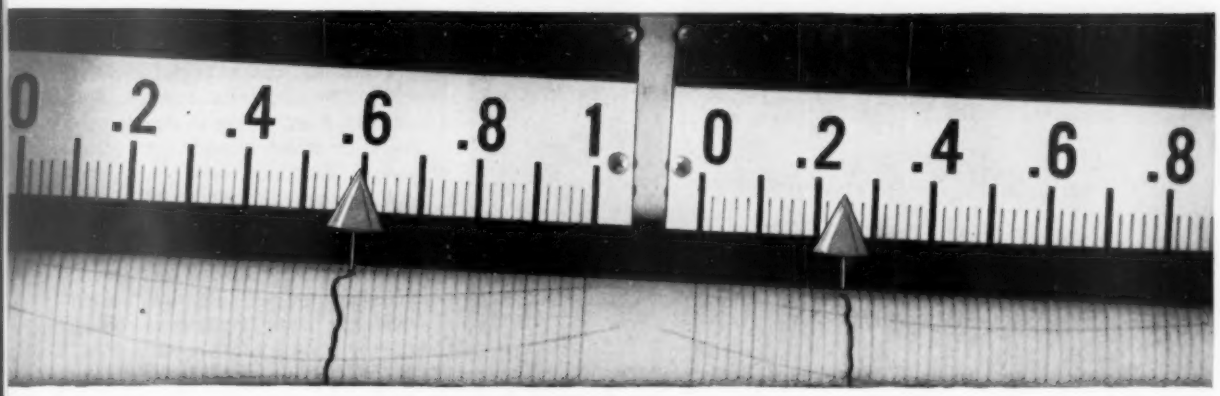
I read your very interesting article in the February issue (page 192) about measuring hard-to-measure jobs. I'd like any additional information you might have on this subject. Also a copy of your worksheets would help in explaining the principle to the foremen. I thoroughly enjoyed reading your magazine.

Marshall P. Walker
Industrial Engineer
Olin-Mathieson Chemical Corp.
West Monroe, La.

► Thank you for your nice comments. We enclose the Multiple Factor Standards worksheet you requested. For more information we suggest you write Mr. Virgil Rotroff, George Elliot Company, Inc., 400 Park Ave., New York 22. He's the expert on this technique.—ED.

Turn the page

plots twin records . . .



This new General Electric Type CH-37 duplex recorder plots two complete electrical records side by side on one ten-inch-wide chart. No more reading separate charts . . . now related functions such as watts and vars, volts and frequency, d-c amperes and speed can be measured and recorded with 1% accuracy on ***one strip chart.*** The CH-37 saves valuable panel space . . . it's only 15 inches wide by $16\frac{1}{16}$ inches high and semi-flush mounted. It features ***throw-away inkwell,*** multiple chart speeds, chart supply indicator, fluorescent-lighted chart face and gasket-sealed door with key lock. Companion models include a new narrow-range CH frequency recorder, self-contained and with accuracy of ±.05 cycles and range of only 58–62 cycles . . . and the CH-7 hook-on volt-ammeter, for accurate recording of dip and peaks on exacting maintenance jobs. Get the complete story on General Electric's line of CH recorders. Just call your nearby G-E Apparatus Sales Engineer or write direct to Section 592–201, General Electric Company, Schenectady 5, N. Y.

OTHER INSTRUMENT DEPARTMENT PRODUCTS FOR INDUSTRY—
Switchboard and panel instruments, electric recorders and controllers, pyrometers, timing devices, speed and color measurement, laboratory test instruments.

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Handles the tough jobs

indoors and outdoors

Most foundries find that smaller "PAYLOADER" tractor-shovels best meet their needs. But in this one a big 4-wheel-drive model is just right. "I couldn't have bought equipment better fitted to the job if I had paid twice as much," says Don LaTulip, the owner.

Four times a day it works indoors scooping up the hot sand, gagger rods and scrap from the pouring floor and dumping it on grizzly bars. Outdoors it picks up and loads out the cupola drops and waste, including 1½ ton slag skulls, also levels the waste dump and does crane and carrying work.

There is a proven size and type in the complete "PAYLOADER" tractor-shovel line that will just fit the tough handling jobs in *your* plant or yard. Carry capacities from 2,000 to 12,000 lbs., plus crane hook, lift forks, pick-up sweeper and snow plow attachments. A Hough Distributor is ready to serve you.

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FACTORY / LETTERS

Begins on page 8

HOW DID IT START?

Sir:

I am in search of information relative to production control. Specifically, I am trying to develop the evolution which brought production control functions under a central staff agency and away from line responsibility.

My research thus far has centered around your publication and articles contained therein. Through correspondence with companies whose executives have contributed to FACTORY, I have amassed considerable original research material. It might interest you to know that I have used articles dating as far back as the latter part of 1933, and I have had responses from authors of articles dating as far back as November 1939.

Has there been anything published which would approximate a history of the evolution of production control?

Lawson E. Snyder
Graduate School of Business Administration
University of Wyoming
Laramie, Wyo.

► We must admit we never have had requests for historical data on production control. Unfortunately, our files do not contain anything that would be useful. Perhaps your librarian could help you locate some early writings on this subject. Your best bet would be to start with the works of Frederick W. Taylor and Henry L. Gantt.—ED.

KUDOS FOR EDITORIAL

Sir:

Just finished reading your article "What Planned Maintenance Means to Me" in FACTORY (September 1957, page 130). I wish to congratulate you. At present my duties are scheduling and your article hit the very core of my job.

T/Sgt. Kenneth T. Ancel
5040th CAM GP, APO 942
Seattle, Wash.

► We are always pleased and encouraged when a reader tells us how a FACTORY article helped him. Our thanks for your letter.—ED.

LOOK *for improvements in industrial handcleaners*

A NEW WAY to clean working hands

There has never been such a combination of *plus* features to keep workers' hands healthy—and therefore on the job day after day!

It's a brand new scientific formulation — non-depleting Lan-O-Kleen *PLUS*.

It's WEST'S famous Lan-O-Kleen handcleaner . . . *plus* a softer scrubbing action . . . *plus* a gentler sudsing action . . . *plus* a soothing lanolin action!

All of which combine to combat the depletion of natural skin oils while hands are being washed clean.

Highly important is the exclusive process that keeps the rich lanolin content of Lan-O-Kleen *PLUS* "free" to soothe and soften. Lanolin is impregnated into a corn meal base, instead of being "held" in the soap by conventional methods. In this way, it is instantly released for more positive, beneficial action.

Lan-O-Kleen *PLUS* is dispensed from a patented, precision-action unit. A clog-proof measuring valve with a mechanical agitator delivers a thrifty, yet adequate individual portion. More than 435 pairs of hands can be washed with each dispenser filling.

FREE TRIAL OFFER. We'd be glad to send five pounds of Lan-O-Kleen *PLUS* and loan a dispenser for free trial. Or we'll send a smaller sample for evaluation. Just call your local WEST office. Or mail the coupon to our Long Island City Headquarters, Dept. 14.

☐ Supply a dispenser and 5 lbs. of Lan-O-Kleen *PLUS*.
☐ Send a small sample of Lan-O-Kleen *PLUS*.

Name_____

Position_____

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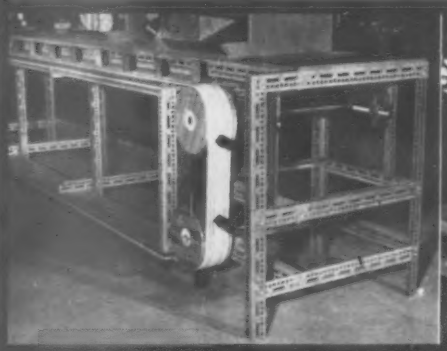
this is DEXION

Throughout the U.S.A., and all the world over, more industries use DEXION slotted angles than all other makes combined . . . for storage-racking, materials-handling, enclosure-framing and the construction of special equipment . . . because only DEXION offers a **complete** range of FOUR sizes, in both steel and aluminum . . . and only DEXION (often imitated, but never equalled) has what it takes — the strength, the all-purpose usefulness — to meet such a great variety of needs, to do so many important things **so well.** Ask for genuine DEXION.

There's a DEXION angle for every job — in warehouse, factory, shop, showroom or laboratory — heavy-duty, standard, light-duty or midget size . . . and a host of DEXION accessories to enable you to build it **better, faster, cheaper.**



DEXION saves time and money

no detailed plans, no measuring, no skilled workmanship, no painting.
easy to use, maintenance-free, waste-free, completely re-usable.

Write for the name of your nearest **DEXION** distributor

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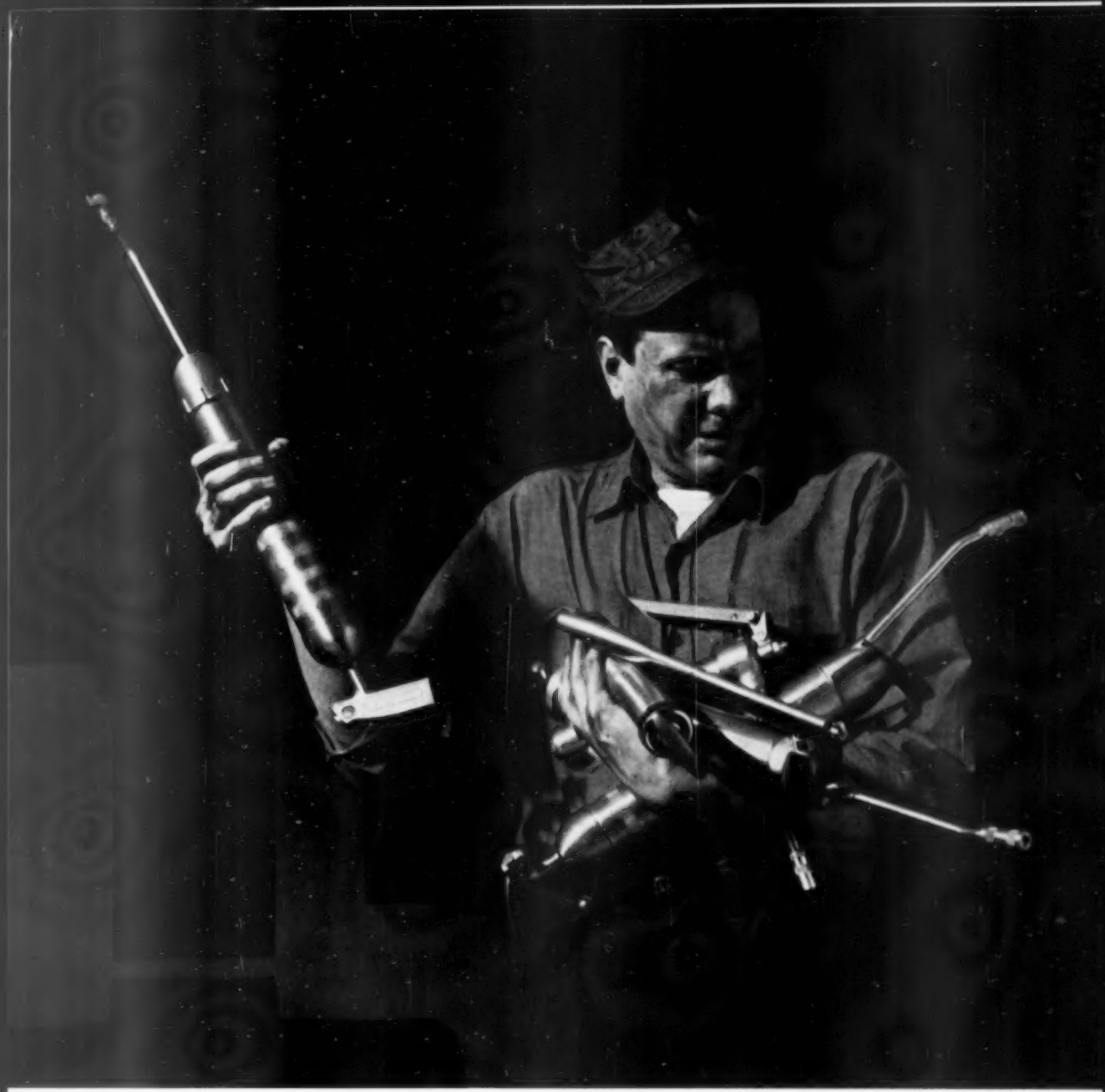

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Get rid of the "guns" that "misfire"

His grease guns are aimed at your profits; they can help boost them—or eliminate them altogether. Here's why:

You used to need a different grease for nearly every job. That meant 20 or 30 lubricants in the plant, with the almost inevitable danger of misapplication — and damaged machinery.

Unless you're operating on the basis of a modern lubrication survey, *the chances are that this situation still exists in your plant!*

A Texaco Organized Lubrication Plan uses a minimum number of proper oils and greases—including newly developed multi-purpose lubricants—to reduce your inventory by as much as 80% and virtually eliminate this problem.

Get the details on Texaco Organized Lubrication. Contact your local Texaco Lubrication Engineer or write for "Management Practices that Control Costs via Organized Lubrication."

The Texas Company, 135 East 42nd Street, New York 17, N. Y., Dept. F-101.

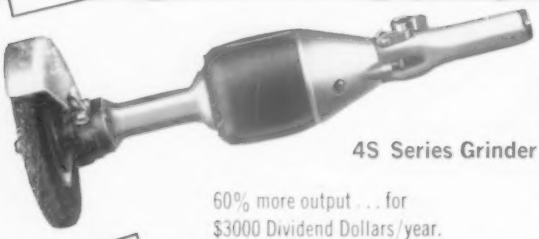
LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

4 NEW SERIES IR GRINDERS

to give you an ANNUAL DIVIDEND on your PAYROLL DOLLARS

NEW *DESIGNS SPEEDS POWER*

NEW



4S Series Grinder

60% more output . . . for $3000 Dividend Dollars/year.

NEW

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25% more output . . . for $1250 Dividend Dollars/year.

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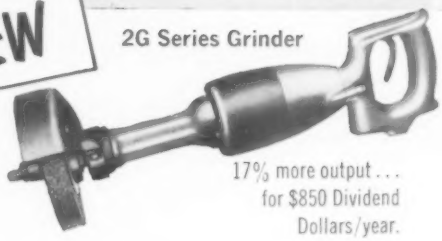

17% more output . . . for $850 Dividend Dollars/year.

If your operators are using older model grinders, you can increase their man-hour productivity by as much as $3000 Payroll Dollars in one year, just by replacing the older tools with one of the new I-R designs.

Multiply these *Annual Dividends* by the number of grinder operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R grinders can help you earn in just one year—without adding to your present payroll.

It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

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Tools plus AIRengineering increase output per man

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B.F.Goodrich TW TIRE AND WHEEL **Analysis Man reports . . .**

B.F.Goodrich "Wired" tires give 5 times the service of other makes, still going strong!

Problem: Lift truck tires used at Toledo Concrete Pipe Co. blew out 2 and 3 times a month, lasted only 6 months. The trouble was caused by scraps of wire reinforcing rods used in pipe construction. Tire and maintenance costs skyrocketed.

Solution: The B.F.Goodrich Tire and Wheel Analysis Man studied the company's complete materials handling setup—then recommended tires designed for this type of work: new B.F.Goodrich "Wired" tires. A special shield of steel wire mesh under the tread protects the tire body from punctures and blowouts.

Results: "B.F.Goodrich 'Wired' tires have been in use 2½ years and to date there have been no repairs," writes Plant Supt. Raymond L. Edwards. In addition, the company has saved 200% on tire costs.

This report is typical of the savings B.F.Goodrich TW Analysis Men can make for industrial tire users. Their services are without cost or obligation—their recommendations unbiased because B.F.Goodrich makes a complete line of industrial tires. To find out how *you* can save, mail the coupon today. A special consulting service is available to manufacturers of materials handling equipment.

The B.F.Goodrich Company
Department TW-775, Akron 18, Ohio

I would like further information on your FREE TW Analysis.

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COMPANY_____

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CITY_____ ZONE_____ STATE_____

Specify B.F.Goodrich tires when ordering new equipment

Smileage!

B.F.Goodrich *industrial tires*

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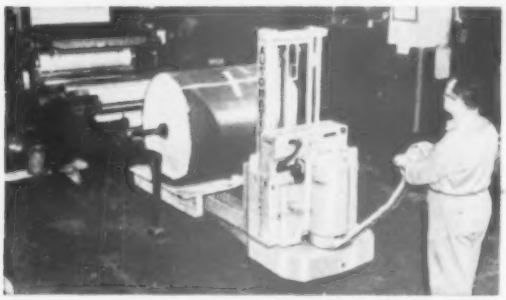
AUTOMATIC

Low-lift pallet Transporter with skid adapter handles both pallets and skids. Model WP has narrow battery compartment for normal use in congested areas... **Model WPY** has wide battery for heavy-duty use. **Models WP** and **WPY** available in capacities of 4000 lbs. and up.



High-lift Platform Stacker spots bulky skidded loads in production or storage areas. Model WLT...capacities 2000 lbs. and up.

High stacking for pallet racks or unit loads, yet easily enters low over-the-road trucks. Only Automatic offers the NEW SKYLIFT Mast...68" mast lifts 144"...for cantilever type stackers in 2000 lb. and 3000 lb. capacity. **WST Model** available in 1000 to 4000 lbs. capacities.

Straddle stackers handle loads in extremely narrow aisles. Load is carried on forks between outrigger arms... eliminates need for counterweight. **Model WAT** capacities range from 2000 to 15,000 lbs.

Transporters

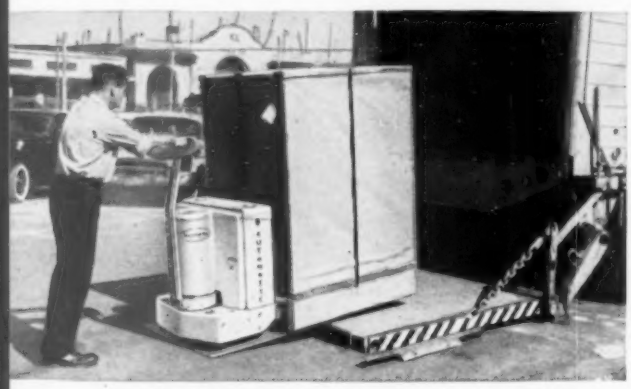
Versatile... Compact... Powerful...

and how they'll cut your handling costs!

For the 1001 jobs in your plant that a walkie-type truck can do, it's your best materials handling buy, dollar for dollar. Walkies naturally cost much less than rider type trucks. So, the same money buys you more units...mechanizes more jobs with greater plant efficiency. The lightweight walkie costs less to operate...and can work easily in areas unsafe or too crowded for the larger, heavier rider-type trucks, yet performs essentially the same functions.

Find exactly what you need in Automatic's Complete Transporter Line

There's an *Automatic Transporter* that's exactly right for your needs. If it isn't among the "popular six" shown here, you'll surely find it among the 50 standard models which can be varied to satisfy the most highly specialized requirements. And...you can have that just-right Transporter on convenient lease or budget purchase terms if you wish.



Transporter carried on truck speeds deliveries of skid loads of paper by the use of hydraulic tail gate. Model WW has narrow battery compartment for normal use in congested areas... **WWY** has wide battery compartment for heavy-duty use. **Models WW** and **WWY** available in capacities of 4000 lbs. and up.

Walkie-rider tractor speeds the selection of order picking... ...of several tractor models. Capacities range from 200 lbs. normal to 1000 lbs. breakaway drawbar pull.

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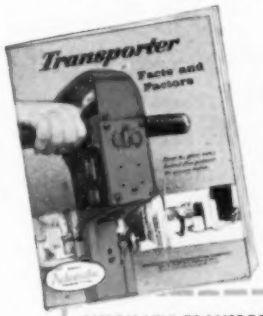

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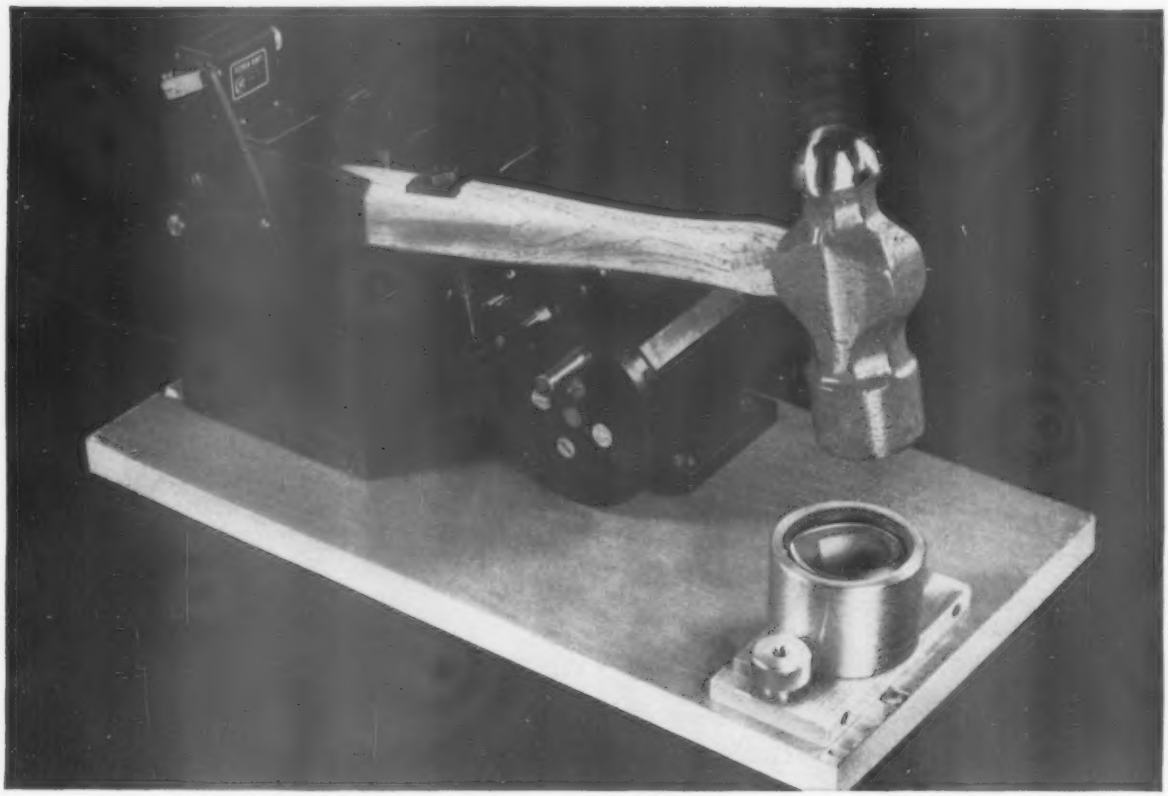
Bal-SAFE lens resists 381,197 blows from 2-lb. steel hammer!



Vivid demonstration of impact resistance shows how B&L toughened safety lenses protect your workers' eyes

We know how to make 'em *tough!* Each blow of the hammer struck the polished lens surface with the force of .87 foot pounds . . . equal to that of a 1⅛" diameter steel ball dropped freely from a height of 50 inches. That's *twice* the impact required in Federal specification for the Drop Ball Test. But it wasn't until the 381,198th blow that the Bausch & Lomb lens finally yielded!

An ordinary industrial thickness (3 m/m) Bal-SAFE lens was taken from stock for this demonstration which was set up as a stunt for the National Safety Congress last Fall in Chicago.

For eye protection, safety lens quality is never a luxury. It may mean the difference between a worker's precious vision and sudden, tragic black-out. Insist on the extra margin of safety of Bal-SAFE lenses for every worker—plano or prescription.

BAUSCH & LOMB

SINCE 1853

INDUSTRY'S MOST COMPLETE LINE

Protection-PLUS Safety Eyewear

protection + economy + worker acceptance

For more facts Circle 465 on Reader Service Card

Hall Industrial Water Report

VOLUME 7 JUNE 1959 NUMBER 3

Take the Simpler Things in Life

What could be simpler than water, air, salt? Or more essential to life? Yet they can destroy steel, copper and other common metals and alloys used extensively in industry.

The Hall engineer is trained to recognize corrosion problems in the making and how to combat them. He can help you locate trouble spots and recommend corrective measures before serious damage has been done. That is one of the reasons why the services of Hall engineers are in demand wherever water is used for boilers, cooling, process or general service.

Corrosion Slows Production

When Hall engineer W. E. Pfeiffer visited a new client he was immediately handed a costly problem. When the weather became extremely cold the part of the plant farthest from the boiler house could not be kept comfortably warm, so that the assembly line had to be slowed.

Although repairs to the condensate return system had been minor, Pfeiffer suspected that corrosion products were interfering with heat transfer and proper circulation in the heating system. His suspicion was confirmed when it was shown that condensate was dissolving iron from the piping.

To control further corrosion and to disperse existing corrosion products, Pfeiffer recommended addition of filming amine (Hagafilm®) to the boiler feed water. As the amine distilled out of the boiler with the steam, it loosened corrosion products and laid down a protective film on the metal surfaces wherever steam condensed. With the initial cleanup period over, heating the whole plant is no longer a problem.

Seeing Spots

A Washington hospital reported to Hall engineer W. R. Greenaway that contamination of steam used in autoclaves was spotting stainless steel surgical instruments plated with chromium and nickel. By examining the instruments with a microscope, Greenaway found the problem was indeed serious. The spots were not just stains, they consisted of clusters of tiny pits.

Corrosion of stainless steel pointed to chloride. None was found in condensed steam samples. Only negligible amounts were present in the water and detergent used for washing. As a last resort Greenaway rinsed with distilled water the cloth used to wrap the instruments. A check on the washings proved the cloth to be the source. Condensing steam in the autoclaves extracted enough chloride from the cloth to cause the difficulty.

The job wasn't quite complete. A trip to the laundry was necessary. There it was found that a compound used in the last rinse was high in chloride. Since this has been omitted there has been no further trouble.

Red Carpet Treatment

Stains and poor dyeing caused by iron oxide plagued a Southern carpet factory. Thousands of yards of woolen yarn had to be reworked and sold at substandard prices.

The call went out for a Hall engineer. H. V. Gedney's quick check of the wash water from the scouring lines showed it to be deep red in color. He then surveyed the plant water system from the intake to the trouble points. After clarification the water was satisfactory. But corrosion increased iron content gradually from the filters through the water heater, storage tank and service lines.

With the problem in focus, Gedney had the plant start threshold treatment for corrosion control with Calgon® Composition TG. The red water problem was stopped almost immediately.

Serious water problems can't always be solved in one day. However, the Hall engineer's training and experience enable him to get at the cause of most troubles quickly.

Water is your industry's most important raw material. Use it wisely.

Protective Coatings

Successful application of most coatings to water storage tanks is limited by several factors: water temperature, coating porosity, abrasion and water contamination. But maintaining the continuity of a coating on submerged portions of tanks is extremely important. The tanks are subjected to an oxygen concentration cell type of attack which tends to center corrosion at breaks in the coating. This can cause rapid perforation instead of slow, even corrosion of the total surface.

The organic barriers can be grouped into three large categories: Elastomers include the natural rubber and synthetic products like neoprene. Thermosetting resins cover the alkyd, phenolic and epoxy groupings plus the newer silicones. Thermoplastic materials embrace the vinyl and vinylidene chlorides and polyethylene plus the various coal tar and asphalt base bitumens. Combinations of various resins, resins and metallics, and resins and bitumens are being used extensively.

In many cases, a coating gives unsatisfactory service because it is not applied properly. All corrosion products and other foreign matter must be removed from the surface to be coated. Sandblasting and wire brush cleaning generally work out better than chemical cleaning unless after-rusting can be prevented.

To summarize, protective coatings can frequently be used to protect water tanks if the proper material is used and adequate care is taken in cleaning the metal surfaces and in applying the material.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information on how the Hall System can help you solve your particular water problems, write, wire or call address below.

HALL LABORATORIES
DIVISION OF HAGAN CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PA.
In Canada: Hagan Corporation (Canada) Limited, Toronto

Hall Laboratories—Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

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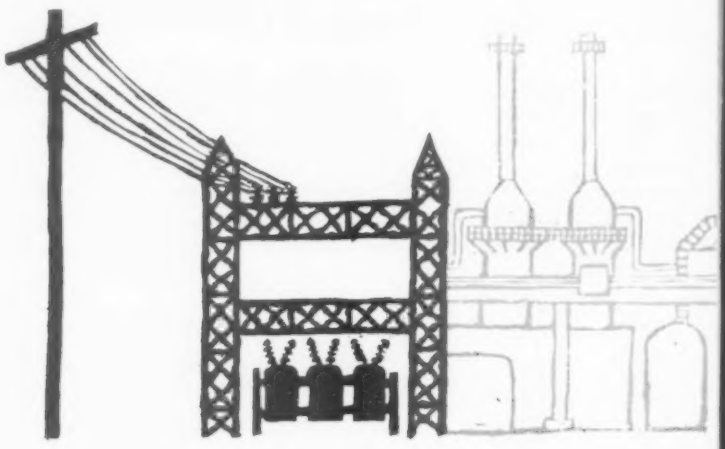
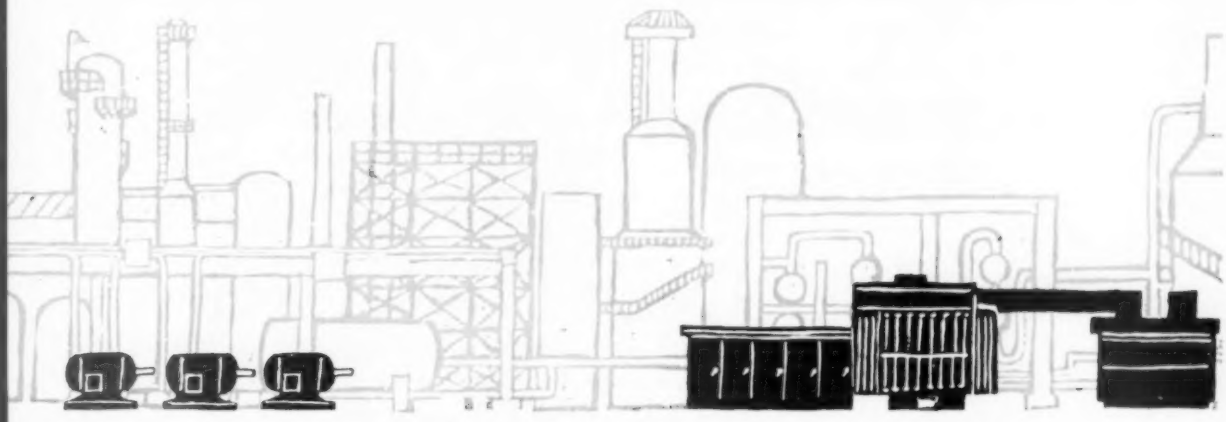
POWER-UP FOR PROFIT



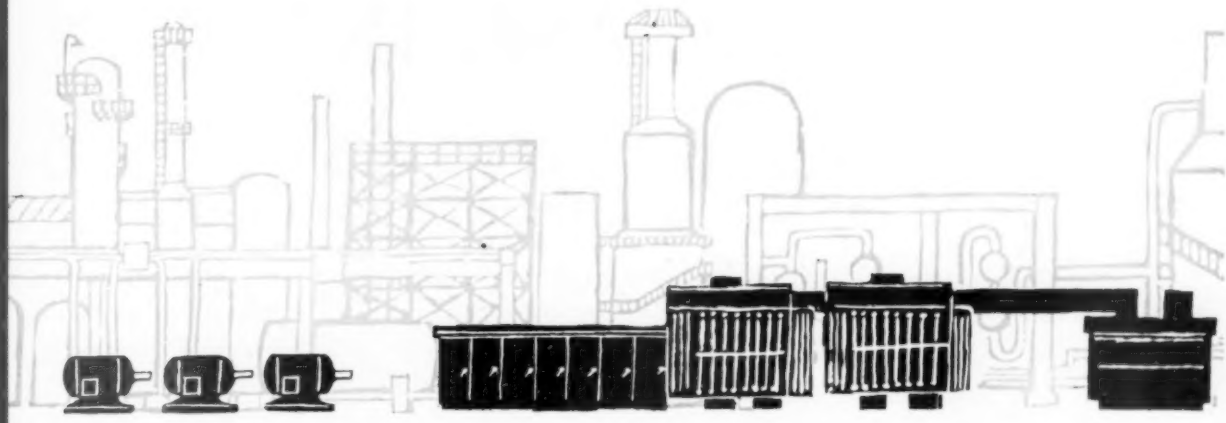
Sinclair Refining modernized

Result: increased production,

ELECTRICALLY



and expanded their Houston refinery



improved products, reduced costs

Greater use of electrical energy and up-to-date electrical equipment can help you get a better return on your investment through improved operations. In your plant, it may be higher capacity machinery, more efficient equipment or engineered controls. Whatever the need, maximum use of low-cost kilowatthours can help you earn satisfactory profits. You will need more capacity to meet the 40% increase in demand for goods by 1965.

Be sure—like Sinclair Refining—that your electrical equipment is engineered to produce earnings as well as output. Call your Westinghouse representative. He can tell you the electrical steps you can take now to start a Power-Up program in your plant. J-96129

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

U. S. Government study finds

AIR CONDITIONING PAYS OFF WITH 9% INCREASE IN PRODUCTIVITY

The findings reported in this advertisement are of great significance not only to the air conditioning industry but to employers and employees everywhere. A copy of the study in its entirety will gladly be mailed upon request.

Carrier Corporation · Syracuse, New York

Do workers produce more in air conditioned space? If so, is the increase enough to make air conditioning pay off?

Today more than ever before commerce and industry are vitally interested in the answers to these questions—but no more so than the Public Buildings Service of the U. S. General Services Administration, responsible for maintaining and operating 74,000,000 sq. ft. of space.

In a just-published document of far-reaching significance entitled "Influence of Air Conditioning on Work Production" the government agency states: "We know, from our previous studies, that a seven-minute saving in time per employee per day will more than pay for the expense of an air conditioning system. In other words, if work production increases only 1.5 percent per year, the system will pay for itself through savings in salaries."

But how much of an increase in productivity does air conditioning actually deliver? Past studies left room for conjecture because of other environmental changes—lighting, acoustical treatment and the like—made at the time air conditioning was installed. So the Public Buildings Service decided to conduct a test of its own, under carefully controlled conditions. Here is how they went about it.

Air Conditioning Only Variable

Two large office spaces were selected, in each of which thousands of clerical "searches" are conducted year after year. One area was air conditioned; the second was not. But in all other respects the two were identical—including lighting, painting, the number of employees (70) who worked in each, average age and distribution between men and women.

For five months—May through September 1957—painstaking records were kept on work rates, number of errors and absenteeism in both groups. As for the results, the report states, "Does air conditioning increase work production? The answer to this important question definitely is 'yes'. The work output of employees in an air conditioned space is greater, on the average, by more than nine percent than that of employees in similar space which is not air conditioned."

Absenteeism Reduced

Air conditioning also has an important bearing on absenteeism. Says the report:

"Accurate records were kept of all sick leave taken and its causes. All absences positively not associated with air conditioning (fractured bones, operations . . . etc.) were disregarded. In the non-air conditioned space, the absenteeism was 2.5 percent higher than in the air conditioned space."

Other benefits of air conditioning on the basis of the evidence were:

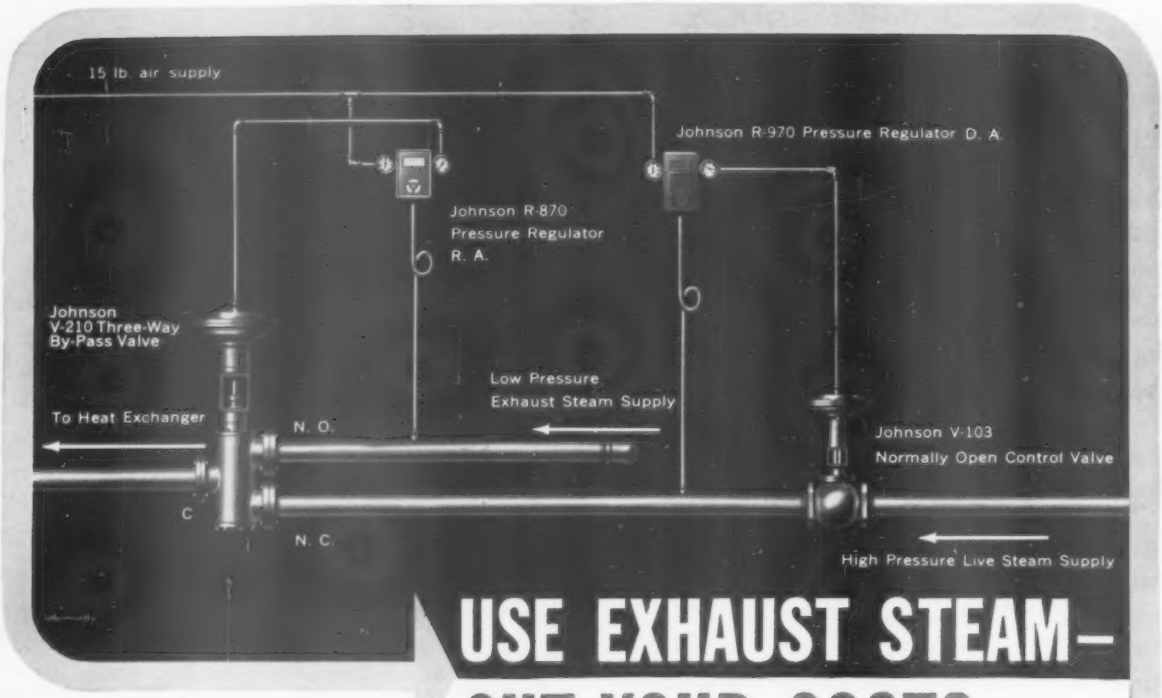
"A slight decrease in errors (0.9 percent).

"A measurable decrease in employees' living expenses (savings on cleaning bills, hairdos, make-up, etc.).

"An important contribution to employee comfort and morale."

Over-all Conclusion

The concluding section of the report reads in part: "It is safe to assume that in any other type of office work, where the rate of production is not standardized, or where no minimum requirement must be met consistently, the increase in productivity will be more than enough to pay for air conditioning through savings in employee salaries."



USE EXHAUST STEAM— CUT YOUR COSTS

Johnson Control Hook-up Switches to Live Steam Only When Necessary

This simple control installation saves substantially on the consumption of live steam. And the savings are automatic!

Operation of the hook-up is positive and dependable. As exhaust steam pressure builds up to usable level, the Johnson Pressure Regulator activates the Three-Way Valve. The valve then shuts off the live steam and admits exhaust steam to the line. When exhaust pressure drops, the process is reversed.

Heart of the hook-up is the Johnson Three-Way By-Pass Valve. The 100% tight-closing design of this valve enables it to do the work of *two* ordinary valves. It can be piped straightaway for easier, less costly installation. Discs and seat rings can also be replaced with the valve in the line . . . for still further savings in maintenance.

Here is a method which can produce large economies for you by utilizing exhaust steam. Its effectiveness has been proved in scores of installations. For further information about the controls used, mail the coupon below.

JOHNSON SERVICE COMPANY
507 E. Michigan Street, Milwaukee 1, Wisconsin 989

Please send me your apparatus bulletins describing the following equipment: ☐ R-870 Pressure Regulator ☐ R-970 Pressure Regulator ☐ V-210 Three-Way By-Pass Valve ☐ V-103 Normally Open Steam Control Valve ☐ New Condensed Catalog of All Johnson Equipment ☐ Have a Johnson engineer call.

Name & Title _____

Company _____

Address _____

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JOHNSON CONTROL
SINCE 1885

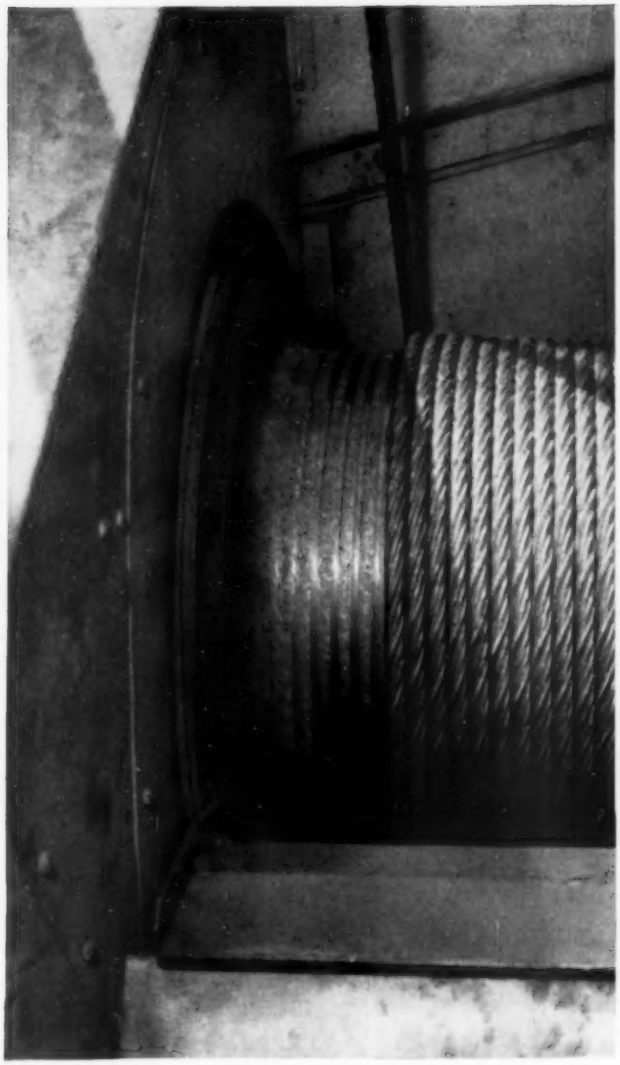
DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

For more facts circle following numbers: 469 Pressure Regulators. 470 Valves.

Herringbone's two pairs of Lang lay strands and one pair of regular lay strands provide the ideal combination of maximum flexibility with good stability.

Finer wires inside contribute to Herringbone's excellent drum-winding characteristics.

Heavier outside wires in each strand have greater resistance to abrasion.



"... we would never hesitate to recommend it"

GRAY & FEAR, CONTRACTORS

This company continues: "We have been using your Roebling Herringbone* for about one year. We find it is one of the best ropes we have ever used, outlasting previous ropes three to one. It is good that such a reliable rope is available."

This is a direct field quote on the most remarkable development in wire rope in years . . . a new concept in wire rope design. Roebling Herringbone is the regular lay and Lang lay wire rope—two-ropes-in-one rope—combining the best features of both.

Herringbone delivers extra flexibility, extra abrasion resistance, unusual structural stability, extra resistance to shock, easy operation over sheaves and drums and smooth spooling properties.

We recommend Herringbone without reservation for general hoisting and the entire range of heavy-duty equipment. Your Roebling Distributor or Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey, will give the full and fabulous details. *Reg. App. For

ROEBLING

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Subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING
HERRINGBONE
WIRE ROPE

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REPUBLIC ROLL-OVER TYPE SKID BOXES

speed up truck shipments at Jernberg Forgings Company

Saving time, money, and storage space! The Jernberg Forgings Company, Chicago, Illinois, is another company that has gone to Republic Skid Boxes adapted for roll-over and crane handling.

Jernberg, a major producer of automotive transmission parts, uses 200 such boxes for storage and subsequent loading of finished forgings into trucks for shipment. They've found that one man now loads a truck in less time than was required by using previous methods.

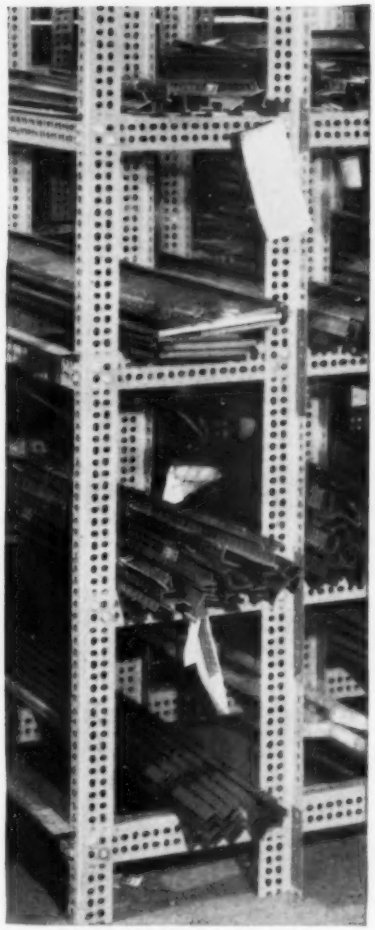
Another 200 boxes—¾ standard size—are used for collection and storage of 3,200-pound loads of cold-sheared forging billets. Despite the extreme weight, Jernberg stacks the boxes high, reducing storage space requirements. This helps save time, too.

Stacking does not damage the boxes. Rugged, corrugated construction and heavy-duty stacking brackets permit tiering to any practical height... assure long, efficient service at lowest overall cost. In addition, four-way fork channels simplify handling in restricted space. Smooth channel around the top eliminates sharp edges.

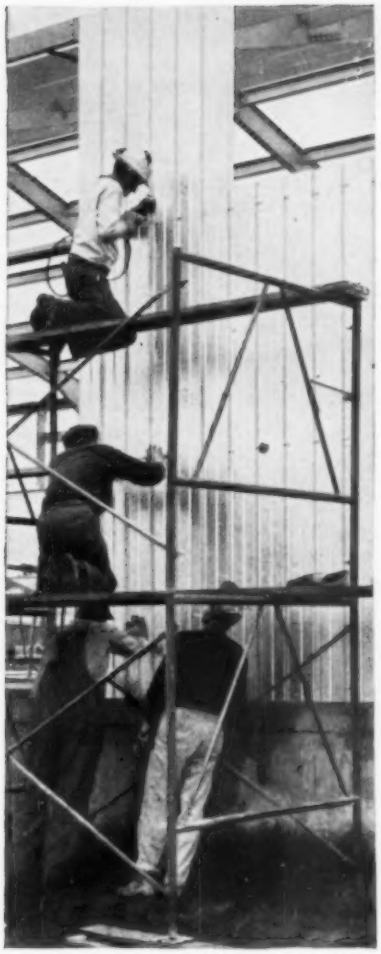
Like the Jernberg Forgings Company, you'll find that the materials handling engineers of Republic's Berger Division can help you save time, money, and storage space in your plant. Let them work with you in solving your materials handling problems. Call your Republic representative or write direct.

For more facts Circle Reader Service Card numbers as follows:

REPUBLIC STEEL PALLET RACKS save space and simplify palletizing and stacking of bulky, uneven, odd-lot and fragile materials. Tubular steel supports adjust every six inches to handle palletized material of any height. Two-way entry permits loading and unloading from either side. Select single pallets from any level without restacking. Write for complete description, specifications, and quotations. Or, have a Materials Handling Engineer call.



REPUBLIC METAL LUMBER® saves time, space, and money. Precision engineered system of short slots placed to allow ¾" vertical and horizontal adjustment, offers unlimited applications. Simply measure, cut, and assemble. Delivered in bundles of 10 angles, .080 gage or .104 gage, 10- or 12-foot lengths, bolts and nuts included. Stores in space of one 2" x 4" piece of lumber. Bonderized to resist rust. Baked enamel finish. Mail coupon for idea-packed catalog.



TRUSCON "BUDGET BUILDINGS" . . . 3-WEEK DELIVERY from order to job site! Here's top utility at lowest cost—the fast, easy way to provide industrial housing or to enlarge manufacturing facilities. "Budget Buildings" are available in widths of 12, 16, 20, 24, and 28 feet—in heights of 10 and 12 feet; and in widths of 32, 36, 40, 44, and 48 feet—12- and 14-foot heights, in any length necessary. Roofing, siding, windows, doors, hardware shipped as a package. Send coupon for brochure.

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Please send more information on:
☐ Republic Materials Handling Equipment
☐ Steel Pallet Racks
☐ METAL LUMBER
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472 Materials Handling Equipment, 473 Pallet Racks, 474 Metal Lumber, 475 Budget Buildings

NEW CP PORTABLE BROACH GUN CONVERTS ROUND PILOT HOLES TO SHAPES

You take the tool to the work with the CP Portable Broach Gun . . . a completely new technique in broaching. Operation is fast and simple. Broach is inserted in pilot hole and with a squeeze of the trigger the hole is formed or finished in a single, swift operation. Set-up time is eliminated since no jigs, fixtures or templates are required in most applications. Drilled, punched or cast holes can be finished to round, square, hexagon, oval, or irregular shapes in any work area. Angle Broach Puller, for close quarters, is also available.

The broach pulls a clean hole every time, and leaves it "mirror" finished. Hole sizing accuracy can be ±.0002. Unskilled operators can consistently produce accurate holes with minimum training time.

CP Power Cell weighs only 58 pounds, operates on shop air lines, furnishes oil pressure up to 7,000 psi. Easily moved from job to job anywhere in the plant. Also powers hydraulic riveters, squeezers, punches.

square

hex

oval

splined

keyed

Chicago Pneumatic

8 East 44th Street, New York 17, N. Y.

Pneumatic Tools • Air Compressors • Electric Tools • Diesel Engines
Rock Drills • Hydraulic Tools • Vacuum Pumps • Aviation Accessories

Can also be used to finish round holes to ± .0002

Portable, air-powered, hydraulic power cell weighs only 58 pounds.

Chicago Pneumatic Tool Co., 8 East 44th St., New York 17, N. Y.

I'm interested in broaching holes. Please send me a copy of Bulletin 581-2. Address Dept. B-4

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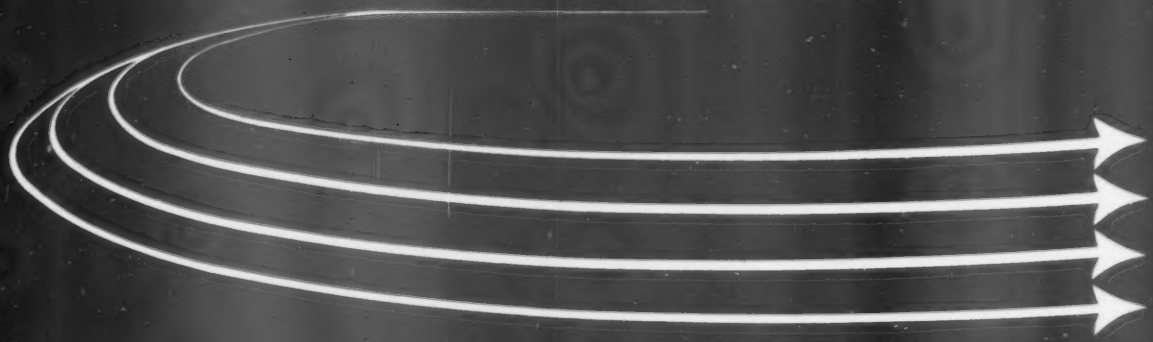
GREAT NEW YALE TRUCKS AND CONCEPTS THAT WILL LOWER YOUR HANDLING COSTS AND INCREASE YOUR PROFITS



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Dimension, in the many ways it must be considered in an industrial plant operation, is the only limiting factor to the application of the ingenuity of materials handling techniques. By developing new concepts in the productive utilization of time and the dimensions of space with which materials handling planners work, Yale Materials Handling Division is constantly advancing the science of efficient handling at less cost.

Research and engineering in dimension of product to create a more efficient and productive unit are a continuing challenge to the manufacturer of materials handling equipment. By increasing the operating range of equipment while decreasing the area and time factors required for its use, new dimensions in product permit more effective, more profitable allocation of valuable plant space and productive time.

The skills of a highly trained product design and engineering department of Yale Materials Handling Division are augmented by the resources of the Yale & Towne Research and Development Division, at Valley Forge, Pennsylvania, dedicated to the design of materials handling equipment which anticipates future industrial needs and makes available, today, equipment for better handling at less cost.

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COMPACT DIMENSIONS, 2-SPEED AUTOMATIC TRANSMISSION PROVIDE FAST CYCLE OPERATIONS

Two speed range automatic transmission—gives excellent gradeability and high tractive effort. 80 feet per minute lift with full load—fast stacking action, speeds operations. Compact dimensions—for high maneuverability, short turning radii. Widest channel roller spacing plus side thrust rollers—resist off center loading, lessen channel wear. Carriage, designed for use with all types of attachments, is roller mounted and has four side thrust rollers. Trail assembly mounted on dual articulating pins supported in rubber—a Yale exclusive—provides much greater stability, a cushioned ride. Gasoline or LP-Gas. Cushion or Pneumatic tires. Capacities: 3,000, 4,000, 5,000 lbs.

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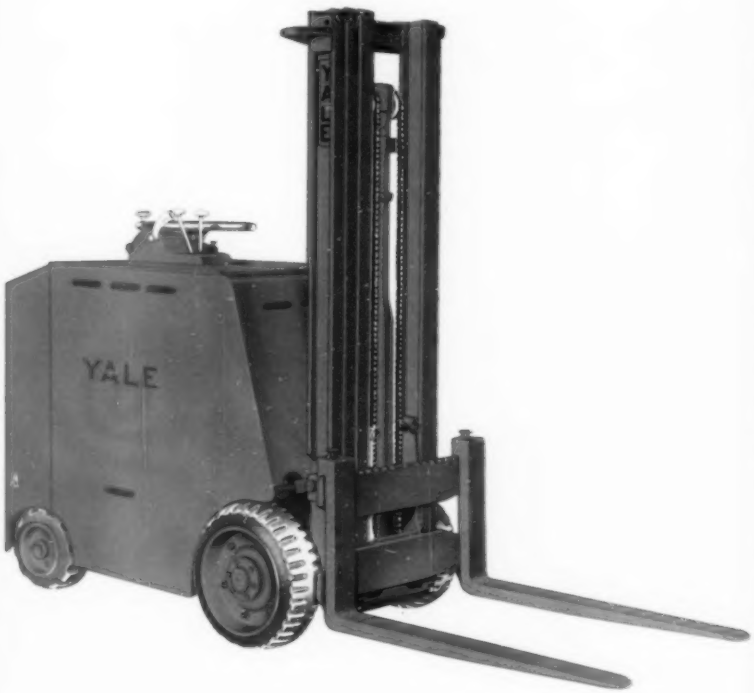
NEW YALE LOW-SILHOUETTE ELECTRIC TRUCK LINE

PRECISE SPEED CONTROL COMBINED WITH SHORT-TURNING MANEUVERABILITY

Mechanically actuated-carbon pile speed control – gives smooth starts and acceleration – produces infinite motor speeds! *Easy steering* – dual caster wheels mounted on ball bearings! Short turning radius – good maneuverability! *Low profile* – 71" mast height. Available with Triplex Mast. Other features include – hydraulic wheel brakes – removable battery box – H-I single lever control for multiple function attachments. Capacities: 2,000, 3,000 lbs.

NEW YALE END CONTROL ELECTRIC TRUCK LINE



SPEEDS OPERATIONS THROUGH RECYCLING SPEED CONTROL

Automatic recycling speed control – speeds operations! *Smooth acceleration* – 4 speeds forward and reverse with time delay between speeds for smooth acceleration! Brakes – mechanical brakes in wheels – step up to apply! Steering wheel positioned for operator comfort and safety. Short turning radius! Available with Triplex Mast. H-I single lever control for multiple function attachments. Cap.: 2,000, 3,000 lbs.

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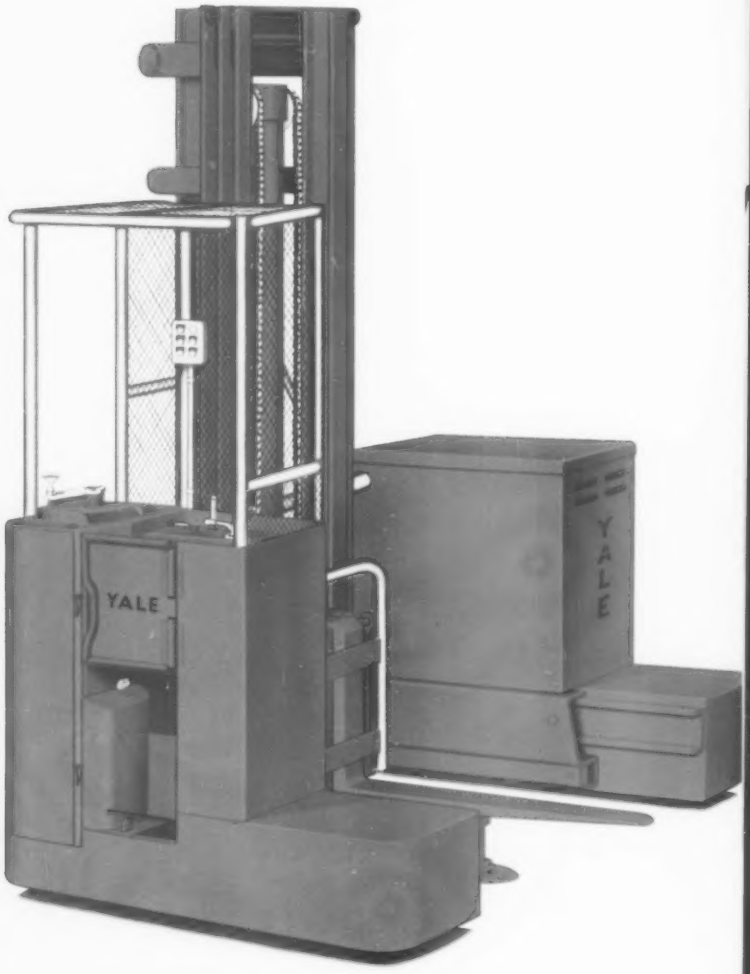
NEW YALE SIDE-LOADER ELECTRIC TRUCK



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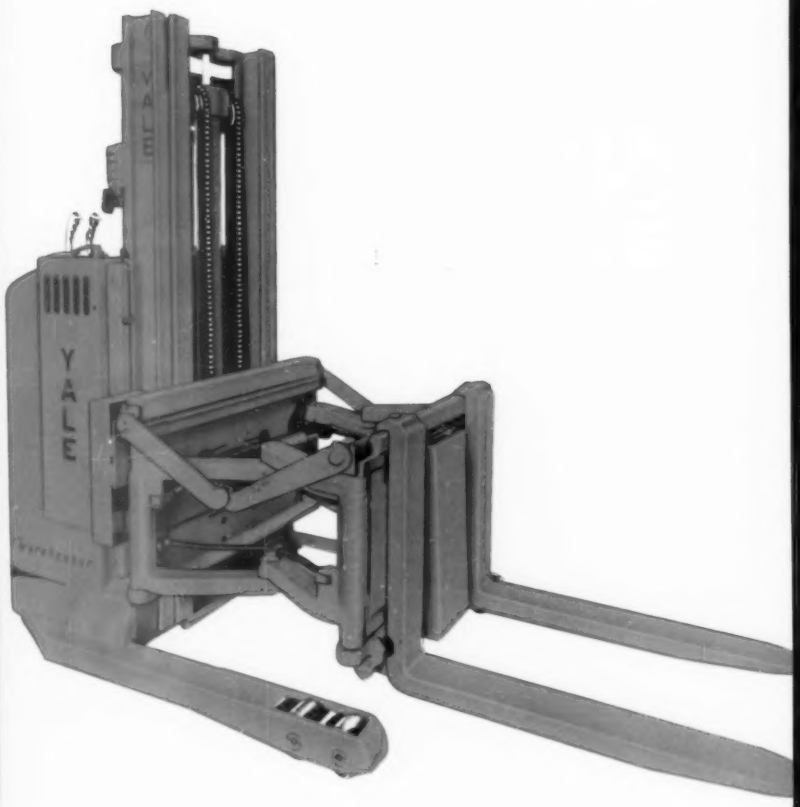
Safe, fast handling in narrow aisle at extreme heights—increases storage space. *Easy accurate load positioning*—cuts cycle time in rack position by 50 per cent. Handles palletized or long loads—high flexibility of application. 24 Volt system—gives *high lifting speed*. Wheels rotate 90 degree—maneuverability in cross aisles. Yale Triplex Mast—rugged, stable, high lift. Capacity: 3000 lbs.

NEW
YALE WAREHOUSER LINE



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More power!—through 24-volt battery system (12-volts if desired). This pays off in faster lift and travel. Faster cycle operations. *More time on the job!* Maintenance costs minimized because all components are in one accessible compartment. *More years on the job!* Durable frame, outriggers and mast are single welded unit. Service access doors protected against bumps. *Operator advantages!* Comfortable driver cockpit! Easy-to-handle controls! Better visibility! Available in Straddle and Extend-A-Load models—2,000, 3,000 and 4,000 lbs.

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YALE GASOLINE TRACTOR LINE

SPEEDS HAULING OPERATIONS, INDOORS AND OUT

Smooth starting and pulling up to full tractive effort! Fluid coupling and large diameter clutch combined for long life in roughest operation. *Rugged design*—engineered for ease of maintenance. Four-speed transmission. Available in LP-Gas. 3,000, 4,000, 5,000 lbs. ultimate draw bar pull capacity!

NEW
YALE WORKSAVER TRACTOR LINE

SPEEDS WAREHOUSE AND TRAILER-TRAIN ORDER PICKING ECONOMICALLY

Maximum hook-unhook speed! Operator positioned with complete visibility and access to coupler! *Operator benefits!* 17" compartment! Large curved steering handle with maximum leverage from minimum effort! 5½" platform height for ease of entry and exit! Sponge rubber floor and guards! *9 x 4 rubber trail wheels!* Smoother ride—good load distribution—long wheel wear! Three-speed control forward and reverse! Dynamic braking plus full positive mechanical brake! Battery: 12-volts. Capacities: draw bar pull, 200 lbs.—maximum 700 lbs.

Send for any or all of these free booklets—learn how Yale Industrial Lift Trucks are designed better, built better and are better on the job!

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LP-Gas Industrial Lift Trucks • Worksavers • Warehousers • Hand Trucks • Industrial Tractor Shovels • Hand, Air and Electric Hoists

The Yale & Towne Mfg. Co.,
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NEW YALE ELECTRIC TRUCK

COMPACT, HIGH SPEED FOR FASTER CYCLE OPERATION

Higher capacity trucks for Yale's popular K51W line. *Small turning radius*—high maneuverability. High lifting speed and travel speed—fast operations. *Compact design*—works in narrow aisles. Easy caster wheel steering—lowers operator fatigue. Yale Magnetic Cam-O-Tactor control—*smooth acceleration* through four speeds, forward and reverse. Full line capacities: 3,000, 4,000, 5,000 and 6,000 lbs.

YALE G-52 WITH NEW TRIPLEX MAST

DOES DOUBLE DUTY— SAVES SPACE, TIME

Mast up! High reaching Triplex Mast stacks high—makes full use of air rights. *Mast down!* Truck maneuvers easily in low headroom areas. *Greater load stability!*—through interlocking I-beam construction. Exclusive Yale fluid coupling. *Economy!* High lift of mast and high maneuverability and minimum dimensions of truck combine to save storage space. Smooth ride saves wear and tear—lowers maintenance costs. Good visibility, simple operation. Cap.: 2,000, 3,000 lbs.

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YALE HEAVY DUTY SERIES G-5 GASOLINE TRUCK

FEATURES RUGGED DESIGN—FAST CYCLE OPERATION

First compact, heavy capacity lift truck to offer the economies of gasoline operation! *Powerful V-8 industrial engine!* For use with forks, single ram, hydraulic split ram or specialized attachments. Capacities: 15,000 to 20,000 lbs. *Speeds cycle operations!* Instant power for fast acceleration from fully automatic torque transmission with 2 speed ranges. *Compact!* Turning radius only 110". *Safe!* Operator positioned for extra measure of visibility. High underclearance. Available with LP-Gas.

YALE HEAVY DUTY K-410 ELECTRIC TRUCK

COMBINES HEAVY INDUSTRY POWER, SHORT TURNING RADIUS

For heavy industry! Accommodates 60 to 72 volt battery. Telescopic, hydraulic lift gives maximum lift per overall height. For use with forks, single ram, hydraulic split ram or specialized attachments. Available with engine-generator power unit. Capacities: 12,000 to 20,000 lbs. *Compact!* Turning radius only 93". Moves easily in and out of boxcars. *Economical!* Designed for easy serviceability. *Speeds cycle operations!* Hydraulic tilt assures greater load stability in travel.

YALE G-3 SERIES GASOLINE TRUCKS

WIDE ANGLE VISION—300% MORE VISIBILITY

Rugged! Carries loads of 15,000 to 20,000 lbs. over rough terrain! Twin cylinder lifting! Low center of gravity! I-beam frame assembly! Extra-durable construction! Stability never before attainable in a truck of this capacity! *Fast acting!* Travels at 20 mph.! Lifts at up to 60′ a minute! Extra-fast controlled lowering! *Extra visibility!* Widely spaced uprights! Excellent ground visibility! Easily convertible to LP-gas. Choice of fluid coupling, standard transmission or automatic torque transmission.

YALE INDUSTRIAL TRACTOR SHOVEL

DOES 10 HOURS' WORK IN AN 8-HOUR SHIFT

Precisely controlled horsepower! 72 hp., 6 cyl. engine provides smooth power through matched torque converter and Yale torque transmission (fully automatic). One speed both ways—inching control—accelerates to 13 mph. in 5½ sec. *Performance!* 2,500-lb. carry capacity. Exclusive 45° bucket tip back for faster loading, lowest carry position. 6′ dumping clearance—only 73″ turning radius. *Safety!* Safety-curve lifting mechanism members mean extra safety for operator. Front and back working lights. Does 25% more work per hour—10 hours' work in an 8-hour shift.

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YALE WORKSAVERS

SMALL LIGHTWEIGHT TRUCKS WITH BIG-TRUCK POWER

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YALE HAND TRUCKS

FOR LOW-COST INTERDEPARTMENTAL HAULING

Ideal for short distance hauling of heavy single-unit or multi-unit loads. Operate singly or as part of integrated system. Platform, pallet, rollaway jack and famous lightweight Zephyr models. Capacities: 1,000 to 10,000 lbs.

*Replacement parts depots assure *immediate* availability of parts at •your local Yale sales and service dealer

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YALE INSTALLS FIRST ELECTRONIC PARTS CONTROL SYSTEM IN THE LIFT TRUCK INDUSTRY

Heart of Yale's new parts system is the IBM Memory Marvel, Ramac, designed to provide top service.

Effective decentralization of parts stocks *where you need them.*

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The ability to project requirements for new equipment in order to have them on hand in convenient locations *before you need them.*

Processing of customer parts orders with greater speed and accuracy.

The ability in case of customer emergency to check national inventories immediately and speed the shipment of the parts from the nearest or most convenient location.

Ramac — another first in Yale's constant effort to provide the best in materials handling products, methods and services.

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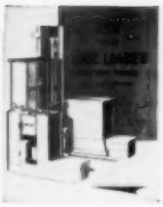
Yale Materials Handling Division, a division of The Yale & Towne Manufacturing Company.
Manufacturing Plants: Philadelphia, Pa., San Leandro, California, Forrest City, Arkansas.
Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks • Worksavers • Hand Trucks • Warehousers • Industrial Tractor Shovels • Hand, Air and Electric Hoists

1. G-54 Gasoline Trucks



2. Side Loader — Electric

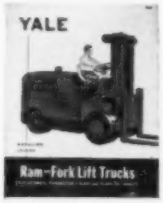
3. K-58 Electric Truck

4. K-47 End Control Electric

5. Warehouser Line

6. Gas Tractor

7. Worksaver Tractor



8. G-5 Series Gasoline Trucks

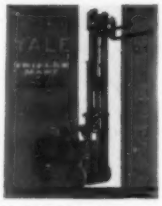
9. K-410 Electric Truck

10. G-3 Gasoline Series

11. Tractor Shovels

12. Worksaver Line

13. K-51W Electric Truck



14. G-52 Triplex Mast

And you'll want to find out more about...

15. Detailed literature on Yale's full line of Hand Lift Trucks.
16. Yale's leasing plan, with complete maintenance, that puts Yale trucks on the job —and keeps them there!
17. Yale's facilities layout program for determining materials handling problems and solutions. (Consists of scale models, templates, vis-o-graphs and a booklet explaining plant layout procedures.)

Check coupon today for any of the 17 Yale subjects that interest you. Full detailed information will be sent out immediately.

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Multi-Million Dollar Plant of American Greetings Corporation

goes modern with
3000 DIAMOND I FIXTURES BY SYLVANIA

When American Greetings Corporation built the world's largest single-floor greeting card manufacturing plant in suburban Cleveland, they placed special emphasis on their lighting requirements. For they had found from past experience that faulty lighting often led directly to production inefficiencies and shipping errors.

SYLVANIA'S DIAMOND I SERIES . . .

An ideal fixture to use where critical seeing tasks call for high quality illumination. Meeting or exceeding all RLM requirements for 20%-30% upward component fixtures, the Diamond I Series offers exceptional efficiency with outstanding installation and maintenance features.

The Diamond I Series is now available for use with high output and very high output lamps in addition to conventional Rapid Start and Instant Start models. Write for complete information.

On choosing Sylvania's Diamond I fixtures to light this smooth-running plant, Chief Industrial Engineer Henry Bernbaum states, "We set rigid lighting specifications and the Sylvania fixtures met all of them from every angle. We now have the quality lighting system we need and we obtained it at a reasonable cost."

The next time *you* face a lighting problem in a new plant or old, look first to Sylvania. The wide variety of industrial fixture types offered by Sylvania allows you to choose the particular fixture that suits your application best. No matter which type you pick you'll know you're getting quality fixtures at a reasonable price.

For *all* of your industrial and commercial lighting needs . . . Go Modern with Lighting by SYLVANIA.

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A Division of SYLVANIA ELECTRIC PRODUCTS INC.
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Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

FLUORESCENT LIGHTING FIXTURES AND SYSTEMS • BEST FIXTURE VALUE IN EVERY PRICE RANGE

Why Settle for *Trichlorethylene* Alone?

DETREX Offers You PERM-A-CLOR, Plus Industry's Most Experienced Engineering Service

Solvent degreasing is a most economical method of metal cleaning. And DETREX PERM-A-CLOR is a premium grade trichlorethylene product—outstanding in stability, cleaning ability and solvent mileage. But PERM-A-CLOR is only part of the DETREX story.

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These experienced technicians stand ready to analyze your degreasing operation, and suggest procedures that in many instances reduce solvent consumption by a substantial amount. Put these experts to work for you today.

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- PERM-A-CLOR NA (Trichlorethylene)
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- Ultrasonic Equipment
- Industrial Washers
- Phosphate Coating Compounds
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- Spray Booth Compounds

Dr. W. L. McCracken has written a most interesting paper—"The Truth About Solvent Degreasing". Send for your free copy.

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World's Largest Exclusive Producer of Cleaning Chemicals and Equipment

This motor can drive

This squirrel cage, open frame, integral horsepower Century Electric motor works fine on dozens of applications. You'll find it giving dependable low-cost service on blowers, fans, pumps, lathes, drilling machines and grinders. **But . . .**

It can't do everything. There are many applications where it won't give good results. That's why you can't use just any motor on your equipment. You need the right motor. The motor that gives you the right combination of torque, horsepower, acceleration and efficiency for you to get top performance from your equipment.

Century Electric can help you get that right motor. Here's why: Century Electric sales engineers are motor experts. They know motors and drive problems inside and out because they think, sell and apply motors and nothing but motors. They can give you on-the-spot answers.

anything . . . almost

Over 10,000 types of motors are available from Century Electric. There is one for every type of application and any operating condition—dusty, corrosive, explosive or moist. Century Electric sales engineers will help you select the right one. They don't have to rely on few types, like this standard squirrel cage motor, to do everything.

For more than a motor—for help in selecting the right motor for your application, just contact your nearest Century Electric Sales Office or Authorized Distributor. A Century Electric sales engineer will be glad to help you.

CENTURY ELECTRIC COMPANY

St. Louis 3, Missouri *Offices and Stock Points in Principal Cities*

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Century

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You are looking at 14 gold-plated garbage cans

Special orders for the Texas-oilman trade? Guess again.

Fact is, each is priced *below* competition. The factory's turning out several thousand this month—for a new customer.

Unfortunately, the gold-plating doesn't show up on the product. Or anywhere else. It's concealed in a cloud of figures covering a month's operations for the whole factory. Weeks from today, somebody'll discover that the company lost money on the order . . . maybe even how *much* money. But now, the damage is done.

This story *could* have had a happy ending—with Automatic Keysort punched-card controls. A Keysort job-costing system could have computed a correct, profit-included selling price. The same system would have shown the plant manager how costs were running at each step of manufacture. He'd have spotted any impending loss *on time* . . . he'd have used his experience and know-how to eke out a profit.

Automatic Keysort is today's only data processing system that provides a family of integrated machines and methods designed for the automatic creation and processing of original records. Speeding vital day-to-day and long-range facts essential to sound management, this unique system fits easily into your present operations...is highly flexible to future growth and expansion.

With the Automatic Keysort System, manufacturing concerns of every size can now enjoy fast, accurate data processing on either a centralized or decentralized basis. Without restrictive, complex procedures. Without specialized personnel. And at remarkably low cost.

Call your nearby Royal McBee Data Processing Representative, or write Royal McBee Corporation, Data Processing Division, Port Chester, N. Y. for illustrated brochure F-2.

ROYAL McBEE · *data processing division*

NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

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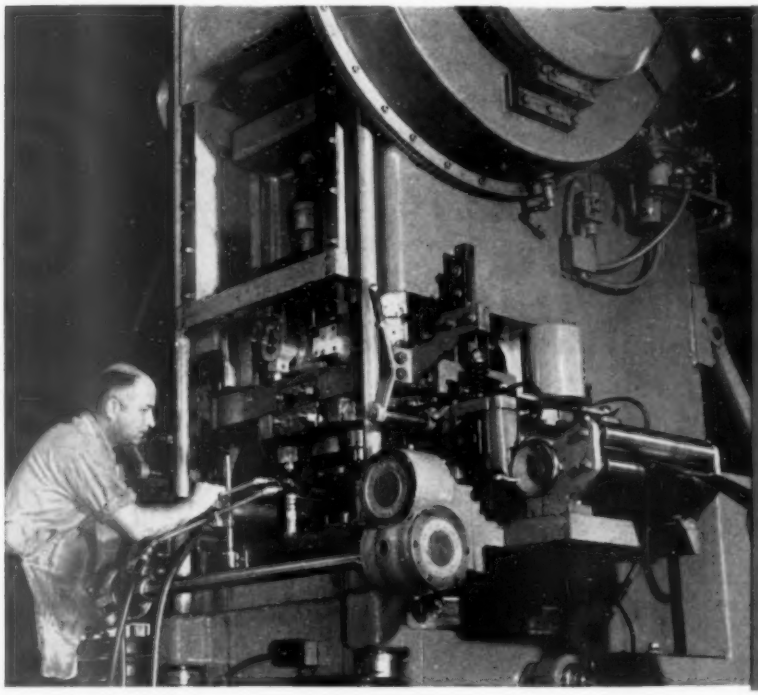
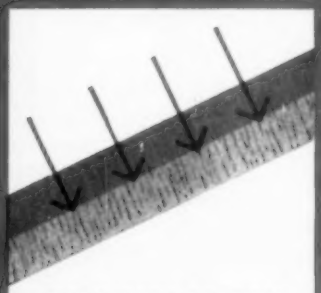
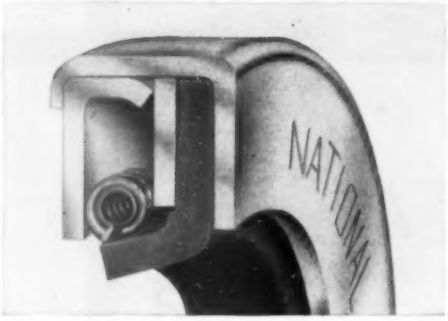
Better products, *faster*, from your National Seal specialist:





MICRO-TORC PROCESS penetrates *part way* to seal outside face; untreated side can absorb lubricant to keep leather flexible.

National deliberately does a "half-way" job on leather to make industrial oil seals better



National Oil Seals feature: 1. *Micro-Torc* process to seal in oil and grease, leave untreated side to absorb lubricant; 2. Minimum tension on garter spring to reduce shaft-torque, increase seal life.

Exclusive Micro-Torc process seals outside face . . . lets inside face absorb the lubricant a seal needs

Natural leather is too porous—must be processed to make it seal oil. So National does a "half-way" job on leather to make it seal better and last much longer.

Micro-Torc oil seals are impregnated part-way through. The coated side seals in oil or grease . . . seals out dirt, dust and water. The uncoated side remains naturally porous . . . absorbs lubricant to keep leather flexible in periods of "starvation." *Micro-Torc* seals run cooler, with less friction and less shaft wear. They last longer; save time and money on replacement.

Your National Seal specialist gives fast delivery on a complete line of leather and synthetic rubber industrial oil seals. Call him today!

NATIONAL OIL SEALS

FEDERAL-MOGUL SERVICE

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN

NATIONAL OIL SEALS

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Build your corrosion-

Bitumastic Super-Service Black—excellent heavy-bodied protection for structurals, tanks, equipment, and concrete, too.

Bitumastic No. 50—the thickest protective coating you can buy—and thickness spells long-life in tough service!

Bitumastic Hi-Heat Gray—all the name implies: a special zinc-base coating for stacks, boilers, other hot spots.

Bitumastic Black Solution—a paint-like general maintenance coating *but* with coal tar's unique protective ability.

Bituplastic No. 28—almost equal in body to No. 50, and an excellent weather-resistant coating.

Bitumastic Tank Solution—for potable water tanks and the like . . . imparts no taste or odor.

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prevention program around

BITUMASTIC COATINGS

Experienced Service
—almost as important as our fine product, you'll get it from our specialists on corrosion.

Bitugloss Aluminum
—used alone, or as a decorative top-coat for Bituplastic No. 28, this coating has amazing gloss-retention.

As with most engineering problems, there's no one, pat answer to all corrosive conditions: that's why Koppers designed the *line* of coatings under the Bitumastic® label. Covering a broad range of cost and protective ability, it is likely that the *one* best solution to your corrosion problem can be found among the coatings in the Bitumastic line.

The common denominator to the protective ability of Bitumastic coatings is coal tar: nature's own "wonder material" that has unique resistance to oxidation and water penetration, common causes of coating system failures. The magical properties of coal tar make a story in themselves, however, and we'll be glad to send you a booklet that describes them more fully.

In fact, if you're not familiar with Bitumastic protective coatings, we'll be glad to send any or all of the literature noted below. Or perhaps you'd like to review your problem with a Koppers representative or an experienced Bitumastic distributor. Just indicate your choice on the coupon below. No obligation, of course.

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That story on coal tar

Bitumastic #50

Bituplastic #28

Bitumastic Super-Service Black

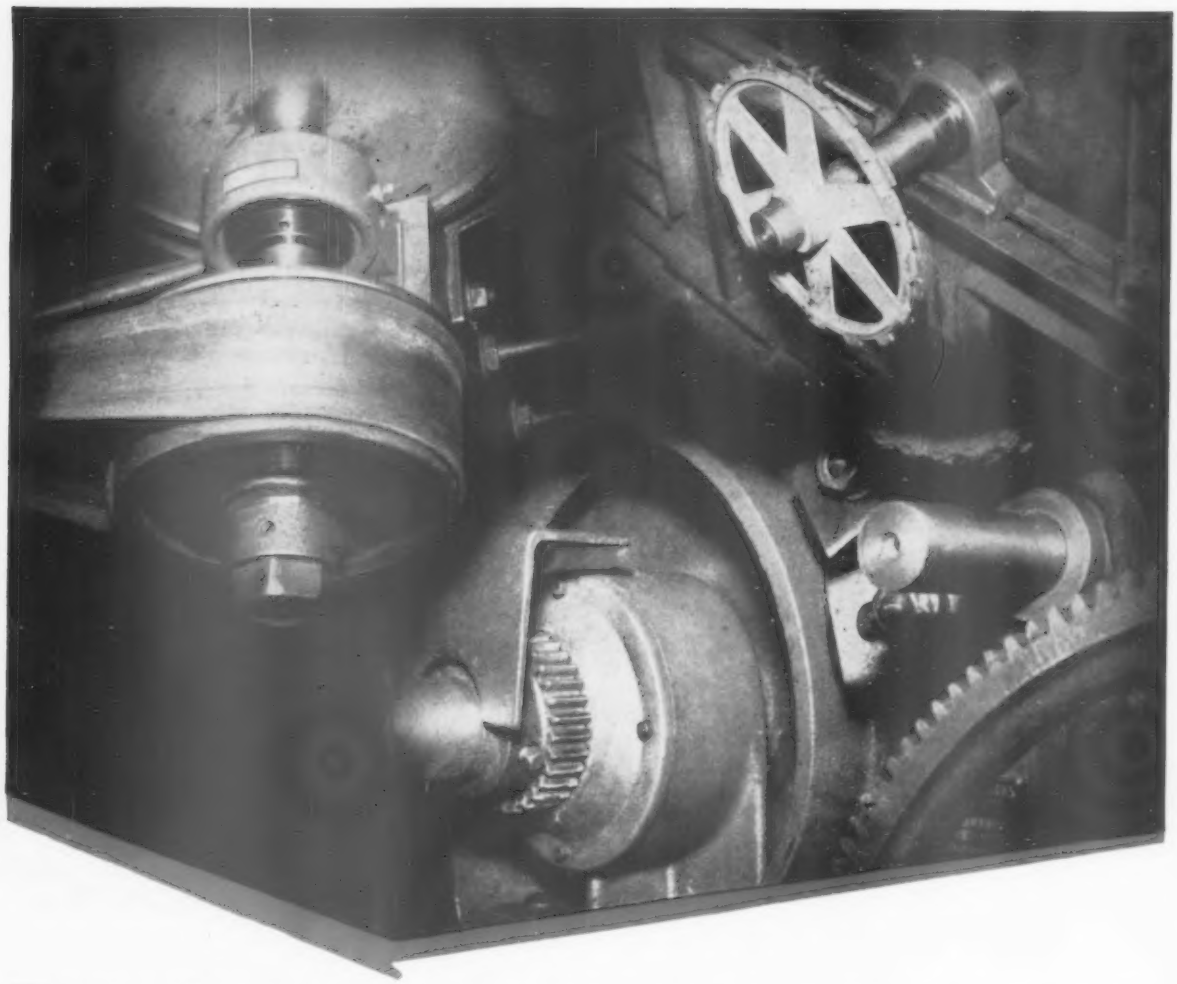
Bitumastic Black Solution

Bitumastic Tank Solution

Bitumastic Hi-Heat Gray

Bitugloss Aluminum

I'd like to discuss my corrosion problem with your man.



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Many of our customers have realized considerable savings by converting to anti-friction bearings. Our bearing engineers recommend the best bearings for each type of application, design and supervise production of the special housings often required.

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Ask a BEARINGS, INC. engineer to survey your production machinery. He may be able to suggest and recommend bearings that will increase production at lower cost. Changeovers from plain bearings to anti-friction bearings are a specialty with us.

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SKIL RECIPRO SAW

cuts maintenance labor costs... replaces tedious hand sawing

YOU GET ALL THESE OUTSTANDING FEATURES...

- **Cuts Close to Walls (with off-center blade)**
- **Doubled Blade Life**
- **Low Maintenance (only 3 main moving parts)**

The new Skil Recipro Saw is an entirely new concept in reciprocating saw design—and the first 2-speed unit ever developed.

It cuts anything that can be sawed by hand—faster, easier, and better. To cut metal fast with minimum blade wear, you just set the switch for LOW speed. For fastest cuts in wood and compositions, the HIGH speed setting is used.

Exclusive 2-position shoe doubles blade life. When one blade section is worn, the shoe can be easily repositioned for cutting with a new, unused part of the blade. And the savings in blade costs quickly pay for the saw!

Engineers and maintenance men alike find its remarkable versatility makes this saw an all-purpose unit that replaces all tedious hand, keyhole, and hacksaw operations. And it does it 5 to 20 times faster. In short, the 2-speed SKIL Recipro Saw offers advanced features not found on any other tool.

WRITE TODAY!

SKIL Corporation, Dept. FMM-69
5033 N. Elston Ave.
Chicago 30, Ill.

Please send me FREE brochure (No. F-14499) containing full specifications of the new SKIL Recipro Saw and illustrating the many ways it can be used.

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SKIL

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THIS NEW BOOK PROVES EDISON IS

THE HIGHER PRICED BATTERY THAT COSTS LESS

SEND FOR IT NOW!

If you operate battery-electric industrial trucks or plan to purchase them, then this new EDISON book **was written for you.** It tells and **proves** how an EDISON battery — through the years — **actually costs less.** Send for this book now. Write Storage Battery Division, Thomas A. Edison Industries, West Orange, N. J. In Canada: International Equipment Co., Ltd., 90 Bates Road, Montreal, P. Q.

COMPARE EDISON

1. **Longer life — lower depreciation**
2. **Reduces maintenance cost**
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6. **No corrosive fumes**
7. **Lowers truck operation cost**
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10. **Other uses after heavy duty life**
11. **Lighter weight**
12. **Edison Nationwide Service**

EDISON NICKEL-ALKALINE STORAGE BATTERIES

Another Product of McGRAW EDISON

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250,000 Power Tools per year with Cities Service Pacemaker T

Porter-Cable, one of the world's largest manufacturers of portable wood-working tools, has long known the value of quality in a lubricant as well as in a power tool. Each piece of equipment made by Porter-Cable is carefully pretested before manufacture and then continually tested for years after its original appearance on the market. It is this kind of thoroughness that led to Porter-Cable's choice of Cities Service Pacemaker 300 T as the hydraulic oil to power their Fostermatic Screw Machines and Landis Grinders.

But Cities Service Pacemaker T is more than a hydraulic oil . . . it is a multi-purpose line of lubricants suited for many applications. Porter-Cable also uses Pacemaker 300 T for lubricating valves in the plant's compressors. Pacemaker T can be used to lubricate bearings, diesel engines, electric motors, generators, reduction gear drives, turbines and in circulating systems.

Pacemaker T is available in various viscosities to give you one line of quality lubricants that can save costly warehouse space by simplifying your inventory . . . cut maintenance costs and extend equipment life. These oils have high viscosity index, excellent heat resistant properties and are chemically fortified against oxidation, corrosion, rust formation and foaming.

Contact your nearest Cities Service office and an experienced Lubrication Engineer will call to make specific recommendations for your plant on the use of Pacemaker T. Or for further information, write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

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Porter-Cable Machine Company
Syracuse, New York

Porter-Cable Research Engineer testing engine for new lawnmower the company will produce soon. All new products undergo extensive research and testing before production.

Backbone of Production Line is Automatic Screw Machine. Pacemaker T gives outstanding performance as hydraulic medium in these machines as well as in Landis grinders and as a general lubricant!

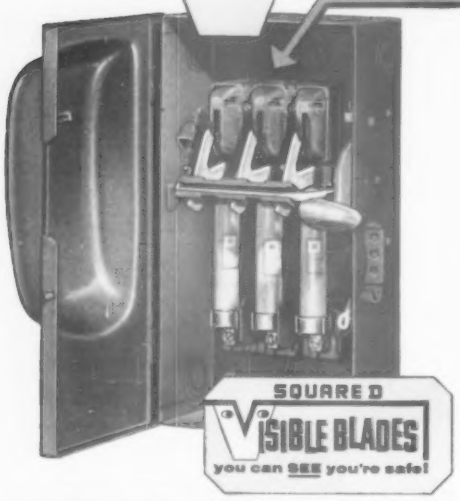
For more facts Circle 487 on Reader Service Card

ASK THE MEN IN THE PLANT!

They'll Tell You the Thing They Want Most in a Safety Switch is **SAFETY THEY CAN SEE**

—and that means

VISIBLE BLADES



The men who pull the switches will tell you what can happen when a switch, *believed* to be open—*isn't.* A lot of things can happen—and every one of them is bad. Personnel is in danger. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

Doesn't it make sense to insist on Visible Blade construction which gives you a road block against any of those possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages?

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

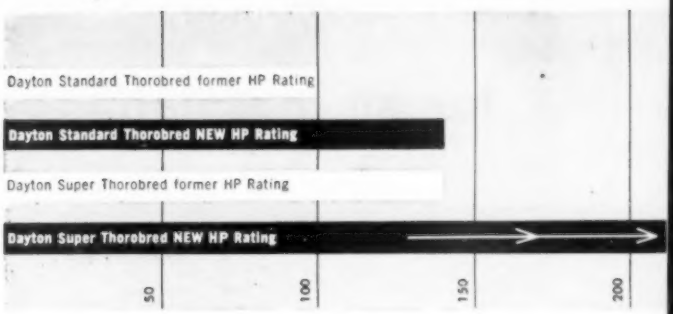
SQUARE D COMPANY

For more facts Circle 488 on Reader Service Card

New HP Ratings on Dayton Cog-Belts® provide important savings in Drive Space, Weight and Cost

Dayton Cog-Belt Horsepower Capacity increased to 200-300% of previous Standard Belt Ratings . . . using existing industry-standard sheaves

- Two Cog-Belts do the work of as many as 6 previous standard V-Belts.
- No special sheaves required . . . use existing sheave stocks on Cog-Belt drives.
- Job-proven Dayton quality is backed by the experience of many actual drive applications throughout industry.
- New ratings approved only after proven by most rigorous research standards.
- Your present sheave inventories cover a much greater range of horsepower capacities.
- Less belts per drive mean less drive space, less drive weight.



Thorobred and Super-Thorobred V-Belts also newly rated

- New Thorobred ratings are now 140% of previous standard belt ratings.
- New Super-Thorobred ratings are now 170-220% of previous standard belt ratings.

Write for new brochure showing how designers can calculate Dayton Cog-Belt drives by referring to existing drive selection tables in Dayton's #208-B Handbook of V-Belt Drive Design. See "Belting" in the yellow pages of your telephone directory for the name of your nearest Dayton Distributor, or write Dayton Industrial Products Company, Division of The Dayton Rubber Company, Dayton 1, Ohio.

Utilize over 30 years of time proven Dayton quality, research and engineering in your V-Belt drive design.

Dayton Industrial Products Co.

A Division of The Dayton Rubber Company, Dayton 1, Ohio

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For more facts Circle 489 on Reader Service Card

MAINTENANCE WORK ORDER
Date 3/3/59
Order No. 9874
Building No. 2
Description and Location
Replace shafting on machine No. 4 (see blueprint attached)
Repair gallery in Bay No. 2
Repair P_2SO_4 supply line (corroded)
Replace safety plate receiving dock G
Replace 100' corrugated galvanized siding south areaway
Replace welded grating in foundry
Replace machine guard in compressor room
MATERIALS:
Call Ryerson

...for all maintenance steel needs

Cold Finished Shafting—Ryerson stocks of t g & p bars provide a ready source for shafting of outstanding size accuracy, straightness and concentricity.

Expanded Metal—Ryex® expanded metal—light, strong, rigid . . . easy to handle—all sharp edges removed. Two types: standard and flattened.

Stainless Pipe and Tubing—on hand in a complete range of types. Valves plus welding and screwed-type fittings also available.

Galvanized Sheets—a wide range of gauges and sizes. Controlled galvanized process provides tight coat of spelter. Sheets stand forming without cracking. Cut or corrugated to your order.

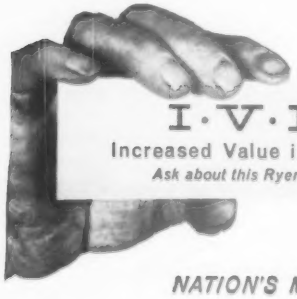
Safety Plate—Inland 4-Way® Safety Plate in two pattern sizes for flooring, stairs, ramps, platforms. Provides plenty of traction. Easy to install, maintain.

Welded Grating—stock-size panels, or tailor-made for your job with all necessary cutouts and banding. Furnished galvanized or painted.

Perforated Sheets—standard patterns in stock; special patterns perforated to order. Available in carbon steel and stainless sheets or plates.

Let Ryerson carry your inventory

These and all other maintenance steels cut to your most exacting specifications—are available from the world's largest stocks at Ryerson. Save time, money, space . . . help your maintenance crew finish faster and have more time for preventive maintenance. Call Ryerson.



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FACTORY . . . PRESS TIME REPORT • JUNE 1959

Looking Ahead in Business

You don't have to look very far to see signs of the improved health of business. Unemployment, for example, has decreased substantially in recent weeks. The number of workers without jobs is now 1.5-million below last year.

The Labor Department has reported more-than-seasonal drops in the number of jobless for two succeeding months. Improvement should continue.

The steady growth of Gross National Product (GNP) is behind the brightening employment picture. GNP is now at an annual rate of $470-billion—up by $17-billion from the year-end rate and well above the pre-recession high.

And with stable prices, the improvement in output is not just a reflection of creeping inflation. Production of goods and services has really reached an all-time record high.

•

The pick-up in industrial output is the big factor in a rising GNP. The index of industrial production is now at 149—well above previous peaks.

The build-up of steel inventories quickened the pace of industrial output in the early stages of the business upturn. But other factors are just as important. For example, the big increase in output of consumer durable goods. Output of automobiles is now over 50% above last year.

The increase in other durables is not as impressive, but it is substantial.

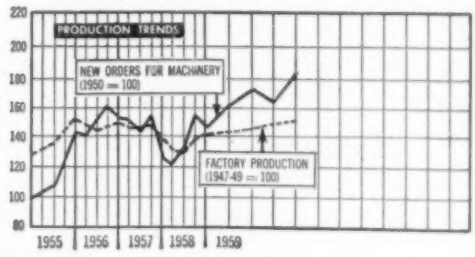
•

Another factor behind the growth of industrial output is the increased capital spending reported in the recent McGraw-Hill survey.

GNP and industrial output will grow with continuing demand for capital goods and consumer goods. Demand will remain strong because personal income is now running at an annual rate $23-billion greater than last year, and corporate profits—before taxes—are about 50% above last year.

Prospects for continued improvement in employment are therefore good.

FACTORY FIGURES OF THE MONTH



Indicator	Apr. 1959[P]	Mar. 1959[r]	Apr. 1958
New Orders for Machinery (exc. elec.)[1]	186.0	165.0	134.0
Contracts for Industrial Construction[2]	126.0	115.0	79.0
Factory Production[3]	152.0	150.0	128.0
Consumers' Prices (cost of living)[4]	123.7	123.7	123.5
Industrial Prices (materials, supplies)[4]	128.3	128.1	125.5
Manufacturing Employment (millions)[4]	16.0	16.0	15.1
Total Employment (millions)[5]	65.0	63.8	62.9
Unemployment (millions)[5]	3.6	4.4	5.1

P = preliminary r = revised

Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board (1947-49 = 100); 4. U. S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Dept. of Commerce, Bureau of the Census.

Until recently businessmen held back on rehiring workers laid off during the business slowdown. Many employees were working short work weeks. But now part-time work has nearly disappeared. And workers in manufacturing are now working a longer week than before the recession. Overtime hours, too, have been rising.

•

Even so, there are a couple of factors that might mar this cheery outlook.

First, interest rates have risen recently. Businessmen who borrow will face higher costs that could discourage spending.

Second, there's the prospect of a steel strike. A strike is unlikely to cause difficulty for business in general. But steel is being used up faster than expected. Thus there's more danger that a long steel strike will lead to shortages for some steel users.

Ideas of the Month

That Nut-Buster is a handy-dandy toolkit (*Borroughs*). Busts frozen or heavily rusted nuts without damaging bolt or threads. **(313)**

Three speeds, with a top of 5.6 miles per hour, plus dynamic braking (through the motor), will commend newest rider-walkie electric tractor (*Yale*) for trailer-train order-picking operations. **(314)**

There are 120 pages of convenient tables, formulas, and graphical symbols in a new booklet (*Westinghouse*), summarizing electrical data, properties of materials, heat transfer and steam information, etc., etc. **(315)**

Easy-to-read chart (*Magnus Chemical*) is your guide to the selection of the right material and the right method for economical removal of all commonly encountered soils from a wide variety of metals. **(316)**

Aluminum chip buggy (*Bliss*) weighs only 180 lb., but can handle loads up to 1800 lb. Plain steel rims or rubber-tired units. **(317)**

No condensation drip this summer if you're using Anti-Drip covers (*Zippertubing*) on your cold water pipes. They'll also stem corrosion. **(318)**

Aquatic weeds in your cooling-water pond? Kuron (*Dow*) is death on water milfoil, fanwort, bladderwort. Won't harm workers or machinery. **(319)**

Duraflex is a waterproof leather boot (*Dunham*) that really keeps water and moisture out. Stitchless construction. Upper vulcanized to cork sole. Leather dries soft and flexible. In 6- and 9-in. heights. **(320)**

Ten types of cutting oils are described in an informative booklet (*Gulf*), provide for just about every metal-cutting need. **(321)**

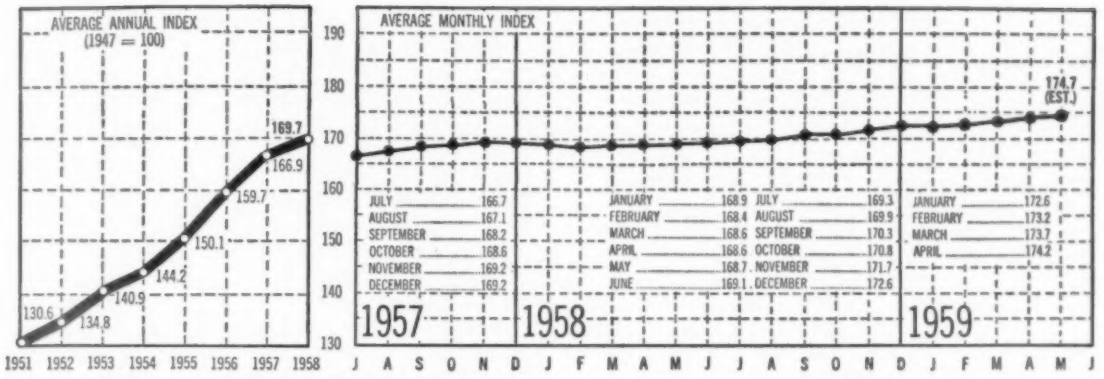
First walk-behind, battery-powered sweeper (*Tennant*) cleans 34-in. path, is designed for use in congested areas. You can sweep over 38,000 ft., operate 1½ hours on a single charge. And change batteries in 5 minutes. **(322)**

Five-minute safety talks is new booklet (*National Safety Council*) that contains 52, one for every week in the year. Written by a foreman for foremen who balk at the thought of making a speech. **(323)**

More Ideas of the Month on pages 170 and 171

FACTORY . . . PRESS TIME REPORT • JUNE 1959

Cost Index of Plant Maintenance



Costs Move Still Higher

Spare capacity in facilities and labor dwindles with rise in factory output.

FACTORY'S Cost Index of Plant Maintenance is estimated at 174.7 for May—an increase of half of a percentage point over the April figure. And the April Index was up exactly the same amount above March. Costs in April averaged 3.3% higher than in the same month a year ago.

Over-all costs of materials were up only slightly in April. In fact, the materials component of the Equipment category of the Index registered a decline—the first decline in this component so far this year. To point up the relative stability in costs of materials last month: Only six of the 39 items for which cost data are collected cost more than in March, four materials cost less, and 29 held at the same level of the previous month.

Labor costs are set to rise higher and higher. Wages of all five of the labor categories in the maintenance area were higher in April than they were in March. The pool of unemployed people is shrinking rapidly as business activity continues its fast upsurge. With the unemployment figure dropping to 3.6-million, there are now approximately 1.5-million fewer people without jobs than were jobless at this time last year. This shrinkage in the available manpower for jobs may have a significant impact on wage trends in the months immediately ahead.

And as output in manufacturing continues strong, the excess in producing capacity is dwindling. With a much tighter situation looming for manpower and production facilities, inflation may be just around the corner.

	AVERAGE 1958	APRIL (Preliminary)	MARCH (Revised)
Building and Facilities Index	160.8	165.3	164.4
Materials	139.2	143.5	142.2
Brick	148.8	152.1	151.7
Elec. fixtures	128.9	127.8	127.8
Elec. switches, boards, fuses	181.5	182.4	182.4
Elec. wire, copper	122.5	139.0	139.0
Glass	152.2	152.0	152.0
Gutters, spouts, ducts	172.9	177.1	177.1
Gypsum products	139.8	140.8	140.8
Heating equipment	127.4	128.0	128.0
Lumber	124.9	134.0	132.8
Millwork	146.9	154.0	149.2
Paint	130.1	130.1	130.2
Pipe, cast iron	170.4	170.4	170.4
Pipe, steel	192.0	189.9	189.9
Pipe & tubing, copper	145.7	156.9	156.9
Roofing	120.4	134.3	126.9
Sanitary fixtures	145.0	156.0	156.0
Sash, metal frame trim	146.9	141.6	141.6
Solder	117.5	123.4	124.6
Steel, structural	231.3	236.3	236.3
Tanks, steel	138.4	137.3	137.3
Valves & fittings	160.6	162.2	162.2
Wire mesh	160.8	162.9	161.9
Labor	175.2	179.8	179.2
Carpenters	160.7	165.6	165.1
Electricians	183.5	188.7	188.2
Painters	181.3	185.0	184.4
Equipment Index	173.6	178.1	177.7
Materials	173.5	174.8	174.9
Abrasives	160.3	161.4	161.4
Alloys, non-ferrous	117.2	126.3	129.2
Bars & plate, steel	223.5	227.2	227.2
Bearings	163.4	164.6	164.6
Belting	150.5	155.9	155.9
Bolts, nuts & screws	229.5	225.4	225.4
Chain	184.0	184.0	184.0
Controls (electric)	181.5	182.4	182.4
Gear-reduction units	181.7	181.7	181.7
Hand tools, mechanics	192.9	198.3	198.3
Lubricants	122.8	123.0	123.0
Motors	147.2	148.0	148.0
Non-ferrous metals	120.9	126.5	127.3
Precision tools	153.2	155.8	154.5
Pumps	184.8	194.7	194.7
Tools, cutting	166.3	168.7	168.7
Valves & fittings	160.6	162.2	162.2
Labor	173.7	180.3	179.5
All mfg. labor	172.2	180.3	179.5
Machine tool labor	175.2	180.2	179.5
FACTORY'S COST INDEX	169.7	174.2	173.7

FACTORY . . . PRESS TIME REPORT • JUNE 1959

Looking Ahead in Labor

You'll see a strong management trend in bargaining today. It's been developing for some time in small competitive industries. It's now gaining among big industrial firms.

The movement is called association bargaining. It has other names, and it varies depending on where it operates. But it has one goal: an alliance of employers to provide equal bargaining power with strong unions.

•

Latest move in this area is being made by the big steel companies in the current negotiations.

The 12 big producers use just four men to negotiate with the United Steelworkers, so it is not technically industry-wide bargaining. Each producer makes his own settlements.

But when the producers began discussing a plan for pooling strike losses, it was fresh evidence that the ties are closing. They discussed a plan for companies operating during a strike to pay their extra profits to shut down plants.

This "strike pool" plan was used by the six big airlines during a strike last year—for the first time. Last year also produced some tighter team bargaining in the auto industry, where the "Big Three" still negotiate separately.

•

These three—airlines, steel, and autos—are among the major industries in which association bargaining so far has failed to gain a sure foothold. But it may be coming.

Such signs are evident in a new bargaining study by the Bureau of Labor Statistics ("Labor on the West Coast," Superintendent of Documents, Washington 25, D.C., 55¢). It reveals some surprises about association bargaining in California, Washington, and Oregon.

In that area group bargaining by employers already covers half the bargaining units and two-thirds of the employers coming under negotiated contracts. It's the big thing among the Pacific coast's small industries. It's growing fast.

There are several key reasons for the advance. There are a few big industries on the West Coast. Unions are strong. So employers have joined up to balance the negotiations.

•

You can learn lessons from the West coast.

Unlike the rest of the country, union organization on the West Coast is high in the retail, trade, insurance, service, and other industries. Where plants are slow to gain, employment is rising in the non-production industries.

Here is where union organization has to come, if it is to grow. That's why these industries have become a national target for union organizers. And, where organizers succeed, employer tie-ups will come to counter the unions.

•

Here's BLS's appraisal of association bargaining:

For the employer—It gives him more bargaining leverage, cuts his negotiation costs, gives him expert personnel, helps equalize his competition. But he gives up authority in dealing with the union and in making his own contract.

For the union—It helps set pattern wage rates—usually at higher levels—and gives the union central control over bargaining. But it also centers negotiations on a business-agent union official, removing the local from close bargaining relations with the employer.

•

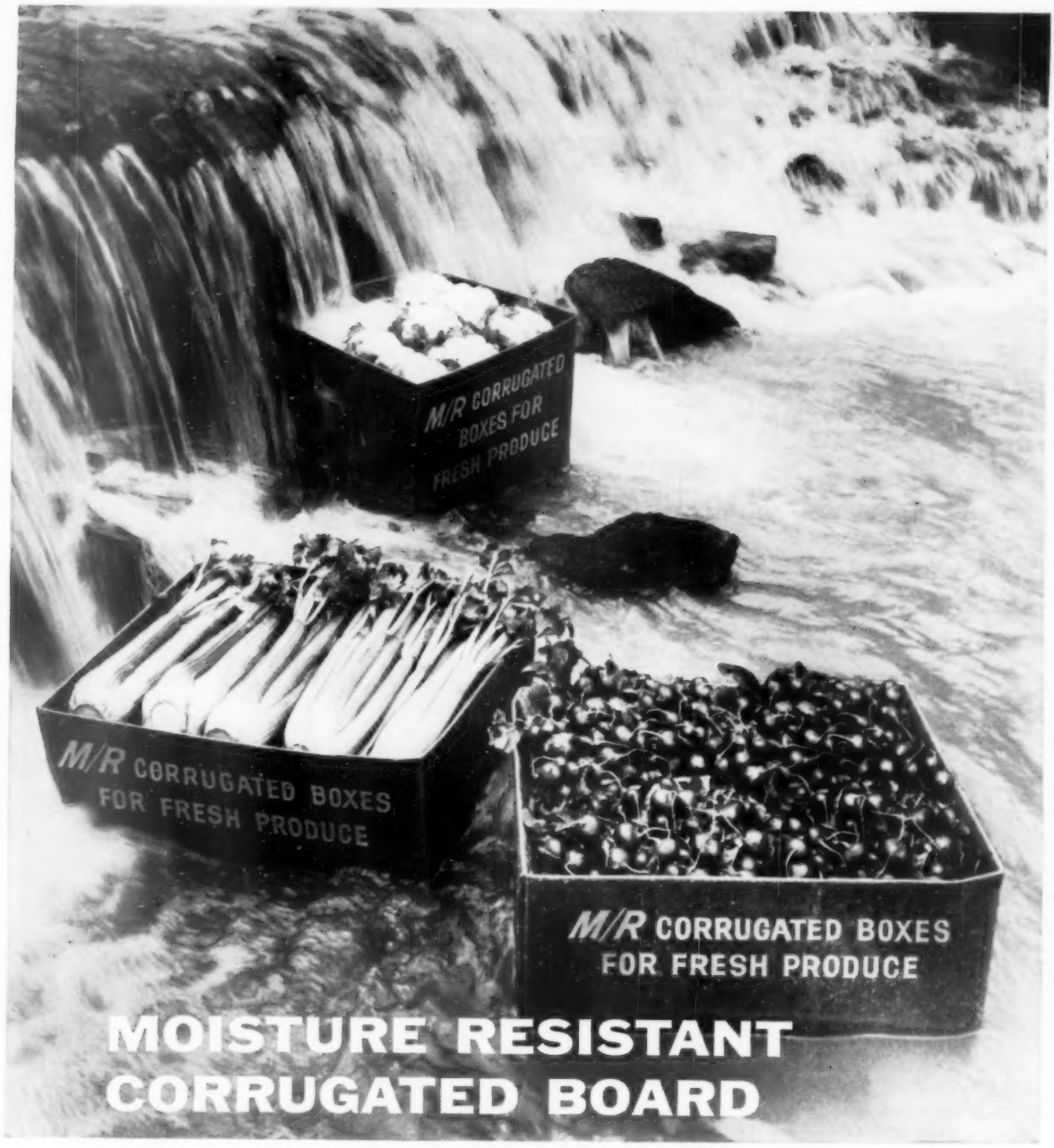
There are some basic federal rules for association bargaining, as follows:

• Employers can voluntarily enter into association bargaining, but unions cannot force them to negotiate this way.

• Association members can lock out employees if the union strikes one member.

• Employer associations do not need formal approval of the NLRB, but either side can recommend a representation election.

SEE LABOR RELATIONS NEWS, PAGE 184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"DISTRIBUTOR DAN, THE SKF BEARING MAN, FOUND THE REASON FOR THE HARD TURNING SHAFT"

"We couldn't find the reason for this condition," the foreman told the mechanic. "Distributor Dan found that the adapter was tightened excessively. He told us to loosen the locknut and sleeve assembly—retighten sufficiently to clamp the sleeve on the shaft but be sure the bearing turns freely. Now he's checking to be certain the bearing has proper clearance."

This is only one example of how *authorized* SKF distributors help solve their customers' bearing problems. Such services can be valuable to you—as vital as immediate delivery from the distributors' large, diversified stocks of SKF bearings.

So, why not find out all the services authorized SKF *distributors offer? Just ask the nearest one to call today.*

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FACTORY . . . OPINION

Material Handling—Growth and Challenge

This month The American Material Handling Society is celebrating its 10th anniversary. In 10 years, the society has grown from a handful of dedicated founders to an organization of some 5000 members in 47 chapters. It has members at large throughout the world. And it has working agreements with similar groups in England, France, Germany, Japan, and the Union of South Africa.

All this is evidence of great progress, and we editors feel that AMHS should be proud of what it has accomplished in its short life. It has played a significant part in helping to highlight the growing importance of improved material handling methods in plant operation.

And they certainly are growing in importance. The concept of integrated material handling is no longer news to anyone. The vast spread of interest in mechanization and in that magic word "automation" has forced operating management men to recognize that material handling *must* be viewed in the light of the total manufacturing process.

When a new plant today is to be built or an old plant to be modernized, invariably a prime requirement is the proper flow of material. When manufacturing operations are to be improved, invariably the movement of material is a key factor in the improvement process. It's no accident, of course, that this is so. There is a solid basis of cold economic facts behind it.

Let's take a look at some figures that spell out more specifically just how important these economic facts are. A FACTORY survey, conducted in 1955, showed that from 20% to 25% of industry's labor hours go into material handling, and that over 10% of *all* hourly workers spend *all* their time on handling work. Another survey, conducted in 1957, showed that over 6% of all plant employees (clerical and supervisory as well as hourly) are engaged in handling work.

Let's be conservative and forget the 20% to 25% of labor hours mentioned above, and pay attention merely to the dollar cost to industry of the 10% of hourly workers who spend *all* their time in handling. With about 12-million hourly workers now in manufacturing, this means that 1.2-million people are wholly engaged in handling work. At current average rates of pay, this amounts to a payroll of almost $5½-billion.

But let's be even more conservative. Let's take the lowest figure—the 6% of all plant employees who spend their time on handling work, including supervisory and clerical people. That's close to 900,000 workers. And the labor cost is about $4-billion per year.

So here we see one measure of just one aspect of material handling—the cost of material handling labor alone. It's at least $4-billion a year in manufacturing, and could easily run to $5½-billion.

No wonder industrial engineers and material handling specialists love to work on handling problems. The reward for improvement can be phenomenal. That it often is is evidenced by the many stories that our readers have seen in FACTORY and in other magazines in which actual dollars-and-cents savings have been cited.

What does all this add up to? For you readers, it points up once again the importance of a never-ending campaign to improve your material handling efficiency. For us editors it underlines the need (which we recognize) for continued effort to bring you news of progress in this field. And for the American Material Handling Society, it offers a positive guarantee that in the second decade of its existence, it will experience no scarcity of important challenge and opportunity. As we wish the AMHS good luck in this second decade, we also pass on to its officers and members the urgent hope that they will continue and expand their good work.

REMINDER: The official AMHS anniversary celebration will take place in Cleveland while the Material Handling Institute's Exposition of 1959 is going on (June 9 through 12) in the Cleveland Public Auditorium. The Exposition is well worth attending to get a picture of the newest and best in handling equipment.

IDEA for one-man assembly line began right here with this group of plant management men looking over a three-dimensional model of the plant.

MANAGED MODERNIZATION At Work

MODERNIZING TO CUT COSTS:

1. Creating a Climate for Ideas

Here's Part 1 (Parts 2 to 5 on following pages) of a cost-cutting and modernization campaign that probes every nook and corner—and really pays off.

TO CUT COSTS the intelligent manager does more than just chip away at labor, material, and handling costs. He also thinks in terms of modernizing plant buildings, production equipment, and manufacturing procedures. That's why the old plant of the Sturtevant Division of Westinghouse (Hyde Park, Mass.) stays youthful—and competitive.

Cost reduction projects (like the one-man assembly line shown here) keep this century-old plant modern in substance and in spirit. They paid off to the tune of $403,000 in 1956, $602,000 in 1957, $493,000 in 1958 (a slow sales year). This year the target is $600,000. The men in these photos vow they'll hit it.

Take a closer look at the one-man assembly line

ANALYSIS of the proposed change was made in the cost-reduction group (rear) and among top plant management men (front).

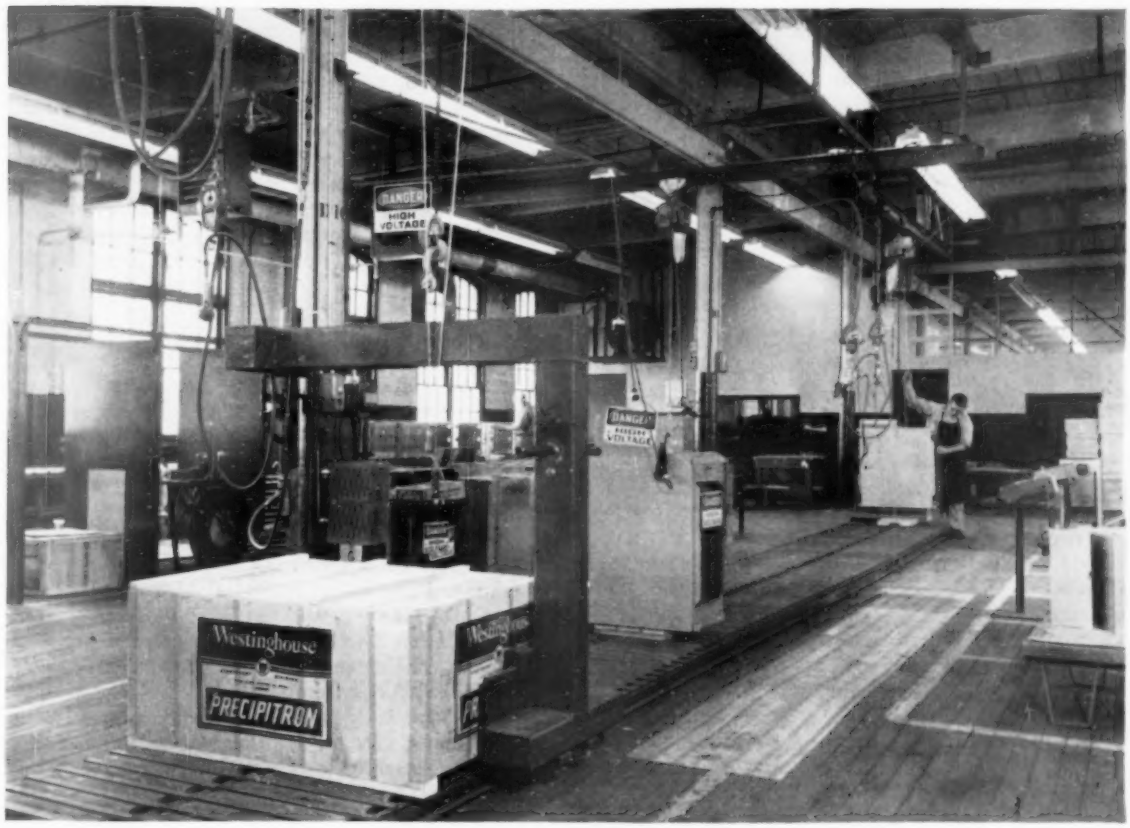
shown in the photo below. It's a good example of Sturtevant-style modernization. The operator at the far end of the line is lowering an air-cleaning subassembly onto the roller conveyor. He'll stay with it until it is fully crated and removed by the C-hook (foreground). Between these two ends, the operator will have employed three motorized cranes, three air tools, and one automatic test mechanism. (You can see all seven time-and-effort-savers if you look closely.) But what's most important, the operator will have cut the average assembly time per unit from 105 minutes to 57 minutes. And this project (which cost $1500) will pay for itself in about 18 months.

MAKING THE CLIMATE RIGHT

What makes the Sturtevant Division cost reduction program pay off? The plant follows a carefully spelled out program (details on page 76). But experienced managers know it takes something more. What's the something here? It's hard to pin down, but listen to these statements:

- "We believe in day-by-day practice, not revolutionary measures . . . Titles can't restrict a manager's responsibility for cost reduction . . . We base our production for normal demand on a two-shift operation . . . When Westinghouse took over this plant in 1945, we installed our standard cost system. Without cost facts you wouldn't know where to begin," says veteran Vice President and Division Manager H. E. Seim.
- "Many ideas look foolishly simple, but if they pay off, who cares? . . . We regard cost reduction not as a burden, but as an operating tool. That's how we used the 3-D layout to dream up the one-man assembly line . . . In the long run, the job of delivering goods on time at low cost rests with the first-line supervisor," says N. J. Grover, manager of manufacturing.
- "We try to get our accounting department to build up cost figures the way we build up the product . . . Procedure isn't the key. The only real bottleneck is the lack of creative thinking. If we have the idea, we can always work out engineering details later on," says J. E. McDonald, engineering manager.
- "All parts of the organization—from production to sales—are living and working more closely together today than ever before," says J. W. Wilcock, marketing manager.

The conclusion? These hard-headed men and their associates successfully modernize through cost reduction because of an attitude, not because of a program. And they do it in an oversized job shop that has five product lines with thousands of optional variations. Yet even in the sales fulfillment area, here's another payoff racked up last year: All delivery schedules were advanced one week, while delivery performance was held at 91 to 93% of commitment.



INSTALLATION of new one-man assembly line (dreamed up on the facing page) came only after cost-reduction and top management groups had weighed its merits. Their judgment is borne out today: Assembly time is halved.

MODERNIZING TO CUT COSTS:

2. Updating Plant Buildings

Eight principles and a budget guide Sturtevant's cost-reduction program

One result: spruced-up buildings that keep the plant competitive.

FACILITY modernization and cost reduction are hard to separate at the Sturtevant plant. In theory, building-modernization projects (like the ones on the facing page) have a cost reduction aspect. But in fact, modernization and upkeep of buildings and grounds are often hard to sell in terms of immediate return. So this Westinghouse plant budgets about $150,000 a year for plant improvements on the grounds of good judgment alone.

COST REDUCTION IS THE GUIDE

The cost reduction gage for modernization here is a tough one. It follows a hard procedure and a cold-blooded screening by many hands. The eight basic elements of Sturtevant's cost reduction program are:

1. Strong program director. Engineering Manager J. E. McDonald heads up the program because "60% to 70% of it involves design changes in the product (although many of these changes originate in manufacturing) and requires engineering opinion and services."

2. High yearly bogeys. "They should be attainable, however," says McDonald. He cites nearly 100% achievement against $500,000 bogeys in past years.

3. Several creative groups. Three strong sources create cost reduction ideas. They are the planned project subcommittee (sales development manager, design engineer, manufacturing engineer, department supervisor, purchasing engineer, time-study engineer), the manufacturing project subcommittee (manufacturing engineer, department supervisors, and design, purchasing, and time-study engineers), and the design engineers working on projects and attending regular cost reduction meetings.

4. Highly placed committee. Action is assured by monthly meetings of the review committee (division manager; managers of engineering, manufacturing, and marketing; superintendents of manufacturing operations and manufacturing engineering; purchasing agent; and the coordinator).

5. Available manpower. Investigations are quickly made and start-up of approved projects is assured by assigning design and manufacturing engineers, tool and equipment designers, methods and layout personnel to assist and carry out plans.

6. Capable full-time coordinator. This man, attached to the industrial relations department, also studies ideas coming from the employee suggestion plan. "He is the catalyst, the needler, the follower-up who insists that schedules be met. He helps break bottlenecks, sets up and handles paperwork. An important man," says McDonald.

7. Effective controls. All projects under consideration are assigned a control number and are listed on a docket. The docket contains abbreviated data such as direct labor and material savings; number of years savings will remain; capital, engineering changes, and tools needed; installation costs and inventory losses due to change. In a typical month, the master docket may show 38 items added, 9 abandoned, 29 completed. Projects submitted to the review committee for approval are documented by a simple form that breaks out set-up time, direct and indirect labor, materials, activity, and expenditures for tools and equipment.

8. Good cost facts. Because this plant has a standard cost system based on time studies, management doesn't have to guess about savings. But McDonald warns against being too literal about analyzing contributing costs. For instance, the plant considers engineering to be available, not to be apportioned against a specific job. When calculating cost of tools, it uses direct cost of labor plus fringe benefits, does not include overhead.

MODERNIZATION GETS A BUDGET

Most of Sturtevant's 566,000 square feet of plant buildings is pre-World War II. Some buildings are even older. But they look good—inside and out. Good looks come from a calculated outlay each year for improvement and upkeep. Here are examples:

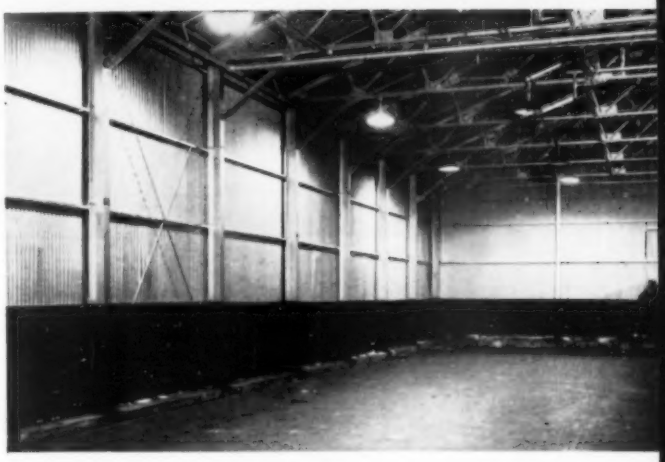
- **Painting.** In 1958, 152,000 square feet of floor space was painted. Exterior sash, several stair wells, and machine tools got a fresh coat of paint.
- **Lighting.** Plant will spend $8500 this year to improve lighting in 10,000 square feet of fan-assembly area, boost light from 7 to 35 or 40 foot-candles.
- **Paving.** Westinghouse has just completed a long-range program for paving its seven acres of yard roadways and surfaces. Maintaining yard areas costs $3500.
- **Power factor.** Sturtevant improved its power factor from 76% to slightly above 80%. Elimination of surcharges of $30 to $40 for each percentage point below 80% saves the plant $1000 per year. Cost of two 120-kvar. capacitors was about $3500. The project is expected to pay out in 40 months.

Old buildings painted up . . .

Dark, dingy interior of this metal-sheathed warehouse is spray-painted. It's part of Sturtevant's continuing program to reclaim storage areas for profitable production use.

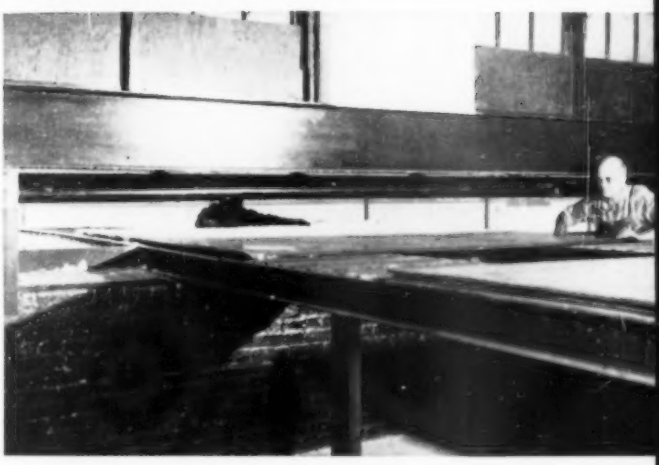
. . . cleaned out for production

Brightly lighted building will now house production assembly shop. Wood block floor has been waterproofed and resurfaced. Craneways will be installed next.



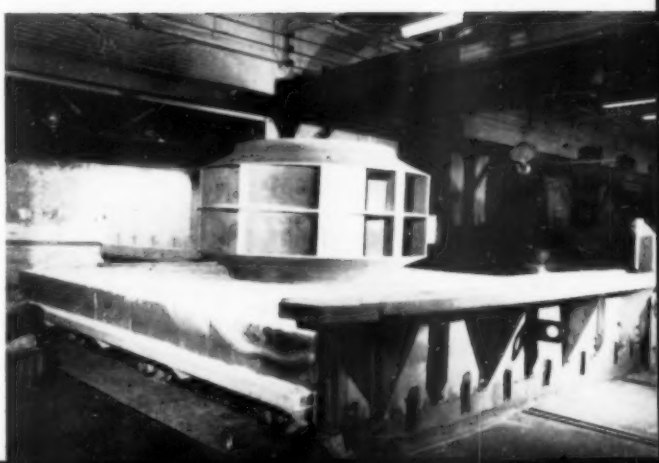
. . . remodeled to reduce handling

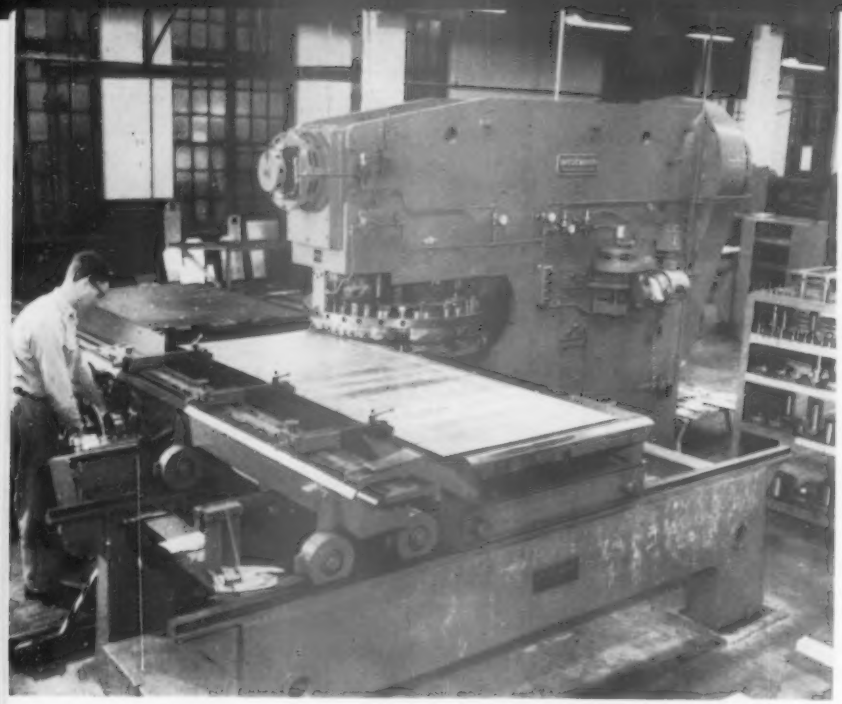
Steel sheet is rolled through slot cut in outside wall. Jib crane (outside) unloads steel from rail tracks adjacent to building, stacks sheets in rack, or places them on roller conveyor. Steel used to be carted from 50 to 500 feet.



. . . enlarged to improve capacity

Furnace floor rolls out for easy unloading of weldments with overhead crane. Carloading floor cost $20,000, saved that much in the first year. To admit large weldments, the door must be jacked up. Project in 1959 will enlarge the opening by attaching a door to the front of the car.





Set-up time reduced

Turret-type punchpress enables operator to make short-run set-ups in minutes. Took two to three hours on old press brake. Machine utilization time is now 73% compared with 31% on replaced equipment. Cost of four new machines: $115,000. Annual savings: $44,000.

MODERNIZING TO CUT COSTS:

3. Improving Production Tools

An eagle eye on every production tool is Sturtevant's answer to a steadily mounting labor bill and competition that's getting tougher every day.

MODERN production tools are the big cost-cutters at Sturtevant. They have to be. The 1200 employees have had a built-in wage increase of 21% (12½% operations improvement factor and 8½% cost-of-living increase) since 1955. In the sharply competitive market for its products Sturtevant cannot pass all this along to its customers. It must rely mainly upon improving productivity through better methods—often achieved by means of better equipment.

Last year this plant spent about $300,000 for capital equipment. It's been doing so for the last three years, will continue to do so in 1959. Cost reduction is the reason for most of this outlay. But new products call for new kinds of machinery, too.

"We like a return of investment in under five years," says H. E. Seim, vice president. "But we have to buy some tools because we can't compete without them.

"Take this example," says Seim. "This year we're buying a 108-in. boring mill with special contouring devices. It will cost us $140,000. The best it can do for us in the way of cutting costs would be to eliminate two men on that operation. At this rate, it will take us 12 to 15 years to get our money back.

"We need these modern machines in many cases because we need the flexibility to accept new jobs. And, of course, in many cases, we're replacing tools we bought years ago at one-seventh their present cost. We have to face the fact that we're putting in a lot of money and taking out next to nothing."

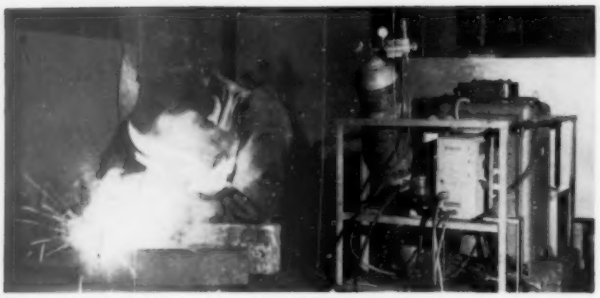
"The job-shop nature of Sturtevant Division's operations limits plant tooling choices," says N. J. Grover, manager of manufacturing. "We can't afford to invest a lot of money in a single tool for a single purpose. Most of our work is non-repetitive, so our equipment must be flexible, even though sometimes at the sacrifice of output."

FIGURING PAYOFF

Sturtevant, like most Westinghouse plants, classifies capital expenditures four ways:

- Plant expansion. New buildings, major and minor.
- Product improvement. To maintain competitive position in the market.
- Cost reduction. To improve profit position on a particular product.
- Necessity. Expenditures for maintenance of service facilities, for shop engineering, and all other.

Requests for capital expenditures are presented on a cost-and-expense analysis form that compares present facilities with proposed facilities. It bases rate of return on the detailed itemizing of outlay and of savings summarized both as a percentage return and in terms of years to pay back.

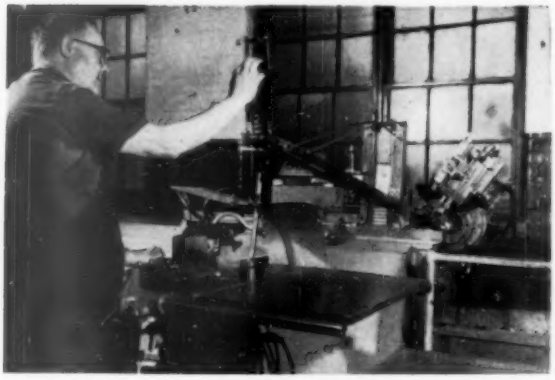


Welding cost cut

Brand new welding outfits net a big saving on power (nearly $100 per machine per year). Maintenance cost (for changing brushes and the like) is cut in half. Downtime for repairs is slashed. Sturtevant bought 26 of these new machines last year, replaced almost all of its old ones.

Product failure avoided

Ultrasonic testing machine inspects critical forgings that must bind hub to wheel for high-speed fans. Rig cost $6600, is needed for modern product demands, tight specifications. Plant also added two Magnaflux machines last year.

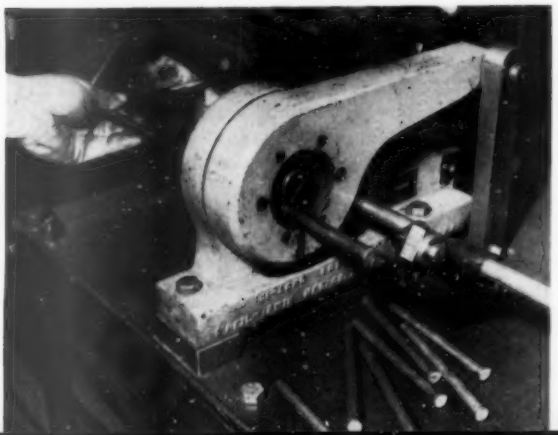


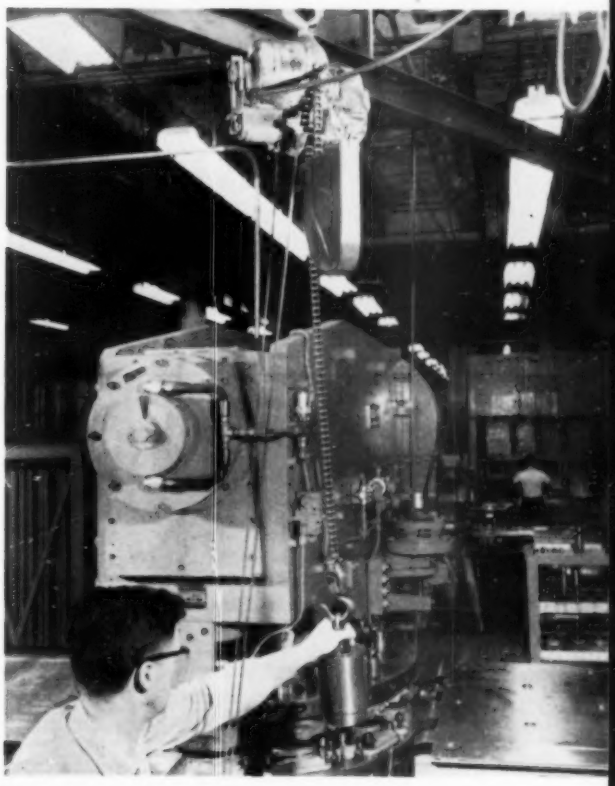
Forming cost trimmed

Hydraulic machine forms return bends for coils at rate of 1200 per hour. Best old machine could do was 250 to 300 pieces per hour. Benefits from new machine: $1800 in labor, $3000 in material annually. Machine cost $10,000 installed.

Burring operation saved

Inexpensive rod-parter slices aluminum and steel rods so clean that there's nary a burr. This "educated shear" cost only $198, chopped cutting time 90%. Gaging device on side also permits quick duplication of length for quantity orders.





Machine loading speeded

Half-ton motorized crane in place of hand-operated chainfalls speeds loading and unloading of dies from 12 minutes to 7. Cost of crane: $320. Payoff: seven months. Plant spent $22,000 last year on one bridge and 12 jib cranes, extension of two craneways, electrification of 25 jib cranes.

Feed stopped faster

Old way—Motor-driven rollers fed copper tubing to cutter so fast that it took time to slow machine down.
New way—Air-operated brake mechanism in foreground clamps tubing when tripped by cutter guide.
Payoff—Machine utilization time increased nearly 100%.

Fins assembled better

Old way—Workman nested fins for radiator bank by hand.
New way—Nesting aid at right (on rollers) holds fins in place as workman slides them to left onto tubing.
Payoff—Cuts time, frees worker's hands so he can attend punchpress (left, rear) as he assembles fin banks.

End bends brazed quicker

Old way—Two workmen held torches on either side of tubing bend to be brazed to radiator header.
New way—Double tipped torch enables one workman, unassisted, to braze tubing.
Payoff—Assures good joint, saves time of one operator.

Tubes brazed automatically

Old way—Operator brazed tubes manually. Could do only 11 in 14 minutes.
New way—Header tips down into furnace (left). Joint is made automatically. Can do 11 to 54 at the same time.
Payoff—Quicker, better braze, less solder.

MODERNIZING TO CUT COSTS:

4. Finding Better Methods

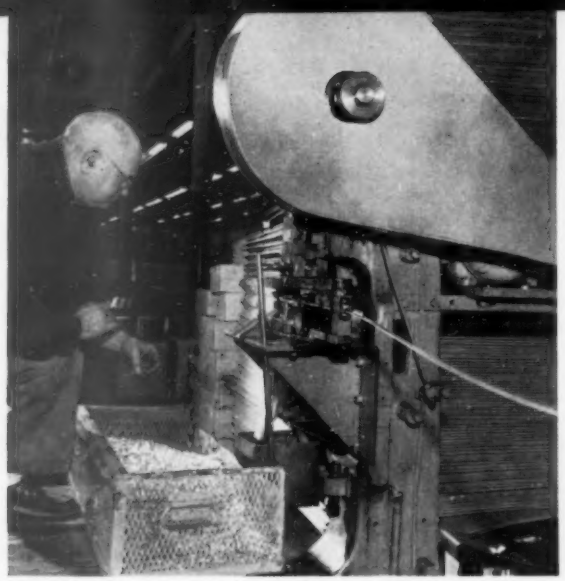
Brainstorming for new ideas—and a relentless search for better ways—turned up these eight methods improvements that cut costs while they modernize.

BRAINSTORMING by plant operating people at Sturtevant produced the cost-cutting ideas on these two pages—and others. Lone-wolf thinking turned up still more. Analysis of product activity (number of times it's used, handled, made) led to others. Still others were discovered spontaneously.

"The other day Norm Grover (manager of manufacturing) and I made a quick cost review of a part right out on the plant floor. We took 25% out of its cost by a simple materials change," says J. E. McDonald, director of the cost reduction program.

Says Grover, when queried about complaints from employees about job improvements: "I'm less worried about handling their criticisms than I am about making sure they have jobs here. Employees, too, are beginning to realize just how stiff competition is."

Sturtevant Division management credits much of its cost-cutting success to elimination or reduction of set-ups and to knowledge of product costs so that expensive operations can be spotted and trimmed. The last factor: persistence. That's what led to the final bolt design at right.



Tubes punched from strip

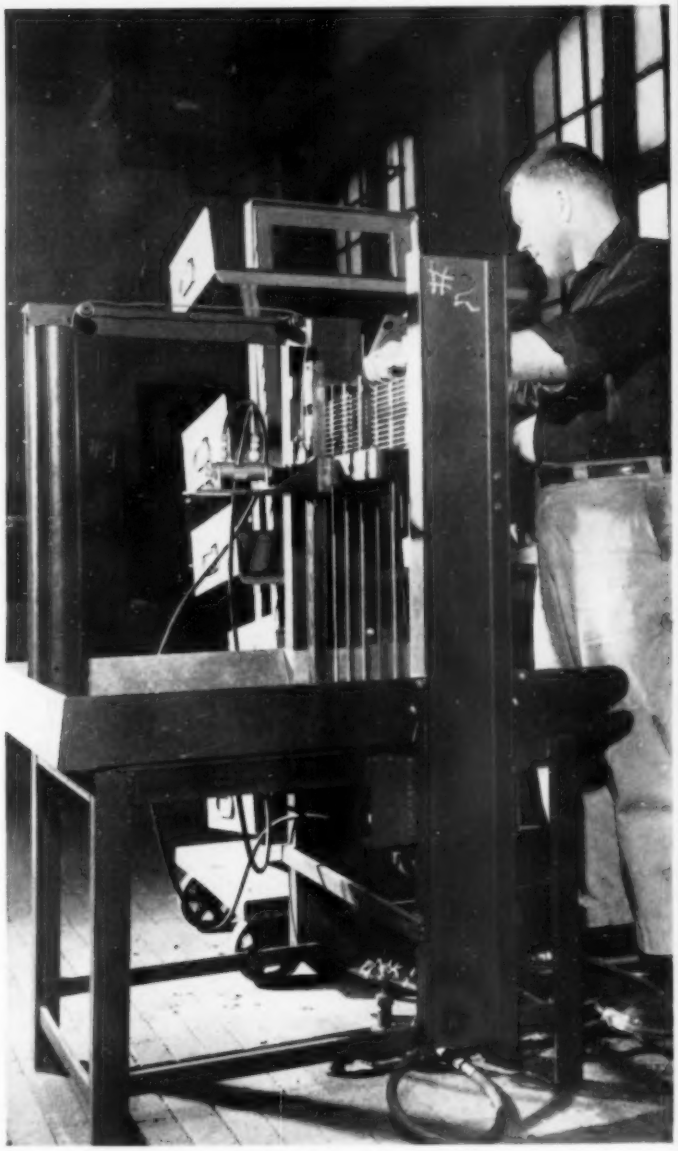
Old way—Spacer sleeves were made from aluminum tubing on $16,000 multi-spindle screw machines. Tooling cost was $500. Production rate: 13,000 per eight hours.
New way—Punched from coiled aluminum strip with precision die ($2850) on light, short-stroke punchpress ($850). Production rate: 40,000 per eight hours.
Payoff—Savings in capital outlay, higher output. Operator is free to attend another punchpress.

More shapes bent

Old way—Brake could bend only two sides of box form.
New way—Notched die face permits bending of all four box sides. Standardized nose punch radius makes permanent machine set-ups possible for two groupings.
Payoff—Saved $11,000 per year in set-up time, increased utilization of brake from 30% to 65%.

Fastening costs cut

Old way—Tempered ¾-in. bolt with Allen head (left) for heavy-duty fan cost about $10 each.
New way—Step 1: Take heat-treated stock, mill slot in head (center) at $5 cost. Step 2: Thread both ends of stock, buy standard nuts. Now cost is down to $2.50.
Payoff—Saves $7.50 per bolt.



Plates positioned automatically

Old way—Workman assembling cell plates and spacer sleeves on spacer rods changed position from squatting to standing as bank built up.
New way—Work is automatically raised to most convenient working height by tripping hydraulic pedal.
Payoff—Work is less fatiguing, assembly time down 15%.

Point-of-use solves storage

Assembly worker removes part from one of several point-of-use storage areas. Common denominator parts are stocked where they will be used, are not given special handling with each shop order. Now storage areas have no attendants.

MODERNIZING TO CUT COSTS:

5. Probing Every Plant Job

They're all fair game in the search for ways to shave costs. These eight examples (photos and text) show how the hunt pays off.

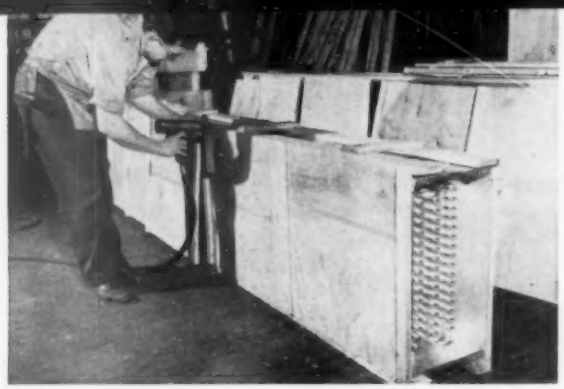
IN A JOB SHOP there's no telling what problem will be toughest for management to solve. This plant solved lots of tough ones last year. Five are shown in the photos. Three more are digested below.

If you've been following this Sturtevant Division story from the beginning, by now you should be impressed (as FACTORY editors were) by the number and variety of ways this plant has solved its modernization problems. Some look programed and calculated. Many others appear to be catch-as-catch-can. But how can so many goals be reached at the same time? We're not sure. But manufacturing manager Norm Grover may have spotted it for us. "Communications are a big thing with us," he says. "At least once a month Mr. Seim calls all managers and supervisors together in the conference room. He talks about business conditions, significant management decisions, how we're doing in the plant, where we'll have to get on the ball."

If communications are important, so are strong control procedures based on frequent personal contacts as well as on reports. "We're not interested in post mortems," says Seim.

Proof of the effectiveness of Sturtevant's system is evidenced by these three examples in addition to those you see in the photos. Briefly, in the past years, Sturtevant has:

- Solved its wage incentive problem. Did this by gradually transferring jobs needing tight control from group to individual piece rates. (Only 4% of incentive workers were on individual rates in 1955. Today 53% are.)
- Solved its paperwork problem. A methods and systems investigation last year expedited the paperwork cycle by two to three days, saved $51,000 this way.
- Solved its inventory problem. By astute purchasing and careful management the plant has improved its inventory turnover rate from 3-1 to 4-1.

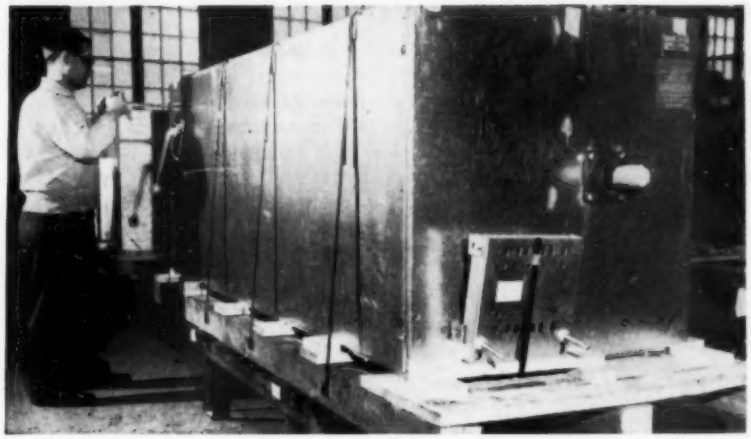


Panels cut packing costs

This workman is stapling modular plywood veneer panels to the crate frame for packaging radiators. Top and bottom of panels are custom-cut. Air gun staples panels. This cost reduction project saves $12,000 a year.

Now one man does this job

Clips stapled to skid member allow one man to do strapping job on this unit. (Second man is used to feed return loop of strap back under skid to man with tool.) Improvements like this in shipping methods save Westinghouse $35,000 per year.



Racks cut steel waste

Scrap racks like these encourage economic use of small steel sheet, saved 500,000 pounds of metal in 1958. Material utilization program has cut metal scrap from 37% to 25% in two years. Only sheets under 18x24 can be discarded. Program also reclaims lumber, corrugated cardboard, and incoming excelsior for packaging dunnage.

Tight tests assure quality

Welding inspector studies samples of approved welds on display in shop. Welders must pass qualifying tests to be certified for jobs. Sturtevant writes its own detailed specifications, adds them to ASME and Navy requirements. Stringent product specifications caused plant to spend $25,000 on new test and inspection equipment in last two years.

What Statistical Engineering Did for Three Plants

PLANT 1

Problem: A machinery manufacturer made a statistical analysis of all components going into its products, found that some 500 parts out of 25,000 accounted for over 60% of its manufacturing cost.

Solution: Concentrate industrial engineering on the costly 500.

Result: Real economies were reached by changes in methods, fixtures, and tolerance evaluations.

PLANT 2

Problem: An iron foundry made a breakdown of its total scrap by types of defect. It unexpectedly found an almost equal contribution to scrap by each type. Some saving could be achieved by reducing any or all types of defect by some percentage. But this was a job shop using several hundred patterns, with runs of about 100 patterns in each week. With such a number it was possible to make analyses by pattern. A breakdown showed that 15% of the patterns accounted for more than two-thirds of the total scrap.

Solution: Concentrate on the pattern that produced most scrap rather than on type of defect.

Result: Emphasizing the 15 big scrap-producing patterns and keeping new patterns out of this category reduced average monthly scrap loss from $20,000 to about $13,000 in four months, to less than $10,000 in eight months.

PLANT 3

Problem: Management wanted to drive down all avoidable costs—all costs not directly incurred in producing acceptable products efficiently. They included scrap, re-operation, inspection, replacement of product under warranty, processes out of control, too-tight or too-loose tolerances, engineering changes, and unequal efficiencies for similar manufacturing operations.

The question: How were these avoidable costs distributed? About equally? Or was a major portion from just a few of the possible causes—and from a few centers?

Obviously such costs could not be avoided entirely. But an almost equal distribution could well be the result of years of effective work by methods men and supervisors, with further gains difficult to achieve. On the other hand, if a serious difference showed up, concentration on those few areas might easily bring in large returns.

Solution: By sampling current activity records for only a few months with detailed temporary record forms, departments were able to secure data breakdowns. The data gathering was spread over many company personnel, reducing the chore of getting the raw information. The accounting department could in most cases translate this data gathering into cost per productive hour.

Result: These day-to-day figures provided a good-sized sample that revealed the predominant influence of a few factors in a few areas—in the plating department, in three machining operations, and in the methods of packing for shipping. With the problem narrowed in this way the plant was able to reduce its "unavoidable" costs by 12%.

Problem-Solving Math Made Easy

Here are new easy-does-it approaches to statistical engineering. You can start using 'em—right now—to reveal those avoidable costs in plant operations.

YOU DON'T have to be a whiz at math to solve the three plant operating problems in the panel above. Yet they are hard problems. Typical, too. Each one involves a search for avoidable costs. Each one involves many interacting factors. And each solution depends on corrective effort narrowed down to the few factors that cause the most variation.

Method for solving the problems above is statistical engineering. Every day now it's providing answers for more operating problems. Let's see how it works.

What do these three examples have in common? Why is statistical engineering so helpful in pointing out answers? Here's why:

- All three problems deal with a total result from a host of causes (some suspected, some not), operating at one time and interacting to some degree. To the mathematician they are polyvariable problems.
- In all three examples, preliminary analysis led to a few major problem areas. These in turn could be studied profitably, in detail, for specific cause-and-effect relationships.

Time and again experience proves that a small minority of causes will contribute a major share of total effect. For instance, when you break down standard output by operations, you usually find that a few out of many operations cause far more than half of the losses. Likewise, when you analyze all variations in an operation—that is, assign them to each of the sources of variation—you usually find that a very few sources cause most of the variation. And if you study job-shop scrap machine by machine, you'll usually find a few of the many machines (or one type out of many types) responsible for most of the scrap.

By DORIAN SHAININ, Director of Statistical Engineering, Rath & Strong, Inc., Boston

Thus the essence of the practical attack on avoidable costs is the pursuit of clues two ways:

- The common-sense and "intuitive" approach of separating out probable important causes.
- Then, with statistical aids, gradually refining the identification of all variables, one after the other, that have a significant bearing on results.

Even in the detailed analysis of specific problem areas, the common-sense approach is always recommended as the first try. It is fast and cheap when it works—as it often does in confirming single or independent factors whose presence can be logically suspected.

But you'll do well to limit the time spent on common-sense trial and error, because fairly easy-to-apply statistical approaches are now available to untangle less obvious cause-and-effect relationships. Although the more sophisticated approaches have a statistical and mathematical base, they can readily be explained to operating management and personnel in non-mathematical terms. The reasonableness of results obtained is apparent to those with some training in the use of graphs and the simple end-formulas involved.

1. FIND "THE VITAL FEW" CAUSES

Look at the graph at upper right. It shows the first step in isolating the areas that promise the greatest returns. It's geared to the problem of Plant 3 (facing page). The procedure works whether it is a department-by-department or center-by-center analysis of all types of avoidable costs—or an investigation of a single factor, like total scrap losses.

All separate units (e.g., individual departments or operations) are ranked in the bar-chart in order of contribution to total effect on scrap loss. Bars are extended vertically to show cumulative results. In most cases, about 5 to 15% of all items (people, shifts, machines, departments) will be found to cause 70 to 80% of all losses. Where the smooth curve through the tops of the cumulative bars shows the marked change in slope, the point of diminishing returns sets in. Extension of the smooth, flatter slope line indicates the portion of losses from these "vital few" that should be recoverable in short order. In one plant, for example, 75% of the savings in reduction of scrap and rework came from 10% of the operations, type or location of castings, and the like.

With savings realized in major problem areas (steps outlined below), Plant 3 can launch a refined attack to recover as much of the remainder as possible—where probable savings will exceed recovery cost.

If an analysis of any type of avoidable cost shows that certain departments or groups are factors, Plant 3 will do well to develop and publish graphic scoreboards early in the program. A spirit of competition from top to bottom, and even with immediate past progress, will stimulate cost reduction efforts.

2. TRY A TRIAL-AND-ERROR SEARCH

When the few areas that cause most losses are pointed out, management's first reaction often is this: "We already know about these trouble areas, but nothing can be done about them." But statistical analysis usually shows management has not really identified the vital few areas. In fact, the real culprit usually turns out to be an entirely unsuspected cause.

The next step in the Sherlock Holmes approach therefore is to start the search for all significant factors in the few problem areas thus far identified. Again, try common sense first. Four sub-steps are involved:

- **Observation**—Look at all phases of the situation in which the result to be controlled occurs.
- **Reflection**—Try to think of all causes that might produce this result. Consult with others who have had experience with this or similar problems.
- **Trial**—Try the influence of the most likely factor. If you're not successful, try the next most likely, and so on.
- **Check**—When you suspect a relationship, turn the effect on and off, like a faucet, by varying the suspected cause back and forth among different levels.

But don't spend too much time on trial and error. If no clear-cut solution emerges, go on to Step 3.

3. ANALYZE AND CHART DATA

Further simple analysis and plotting will usually add light.

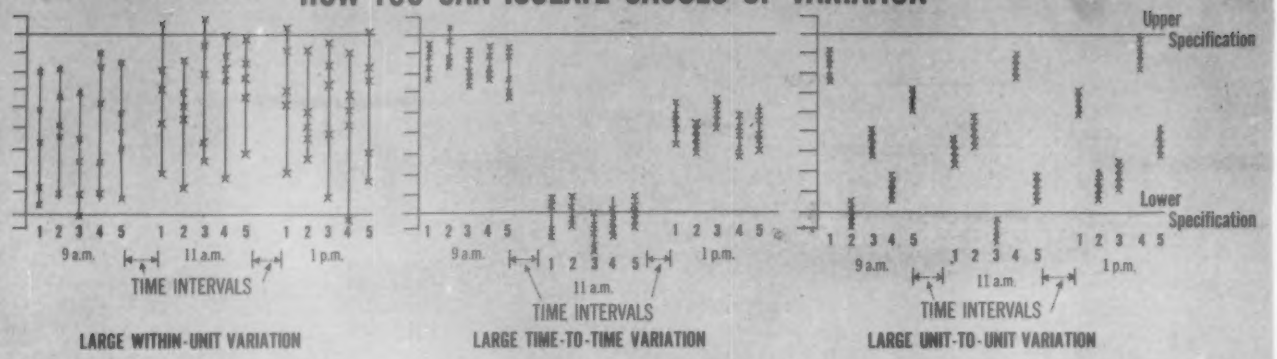
The Multi-Vari Chart—This effective device (3-part chart, top of next page) was originally proposed by L. A. Seder ("Diagnosis with Diagrams—Part I," *Industrial Quality Control*, Vol. VI, No. 4, January 1950). With it you can isolate groups of causes of variation independently—variations within a piece, or component, or operation; variations "piece-to-piece"; and variations "time-to-time."

For example, if repeated tests on the same piece of electronic equipment account for a large share of undesired variation, then you must look for the causes in the test method, the test gear, the test conditions, or the lack of uniform activity in the equipment.

In many operations hour-to-hour fluctuations may account for costly product variation. Although the Multi-Vari analysis was first applied in the process industries, it is applicable wherever many variables may be causing effects. Thus you can use it in analyses aimed at reducing variations in boring, turning, punch-press operation, heat-treating, and the like.

With the Multi-Vari Chart you can determine the

HOW YOU CAN ISOLATE CAUSES OF VARIATION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Lower Specification
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9 a.m. 11 a.m. 1 p.m.
TIME INTERVALS
LARGE WITHIN-UNIT VARIATION
LARGE TIME-TO-TIME VARIATION
LARGE UNIT-TO-UNIT VARIATION

total variation attributable to changes within a unit, or from unit-to-unit or lot-to-lot of raw material, or from machine-to-machine, hour-to-hour, operator-to-operator, shift-to-shift, day-to-day, or for any other reasonable comparisons.

Every manufacturing operation has distinctive classifications. For example, a foundry would add cavity-to-cavity differences, cope-to-drag differences, batch-to-batch differences in sand, heat-to-heat differences in metal, and the like.

For the Multi-Vari Chart you select small samples at appropriate times and graph them as shown above. There you see five measurements on each of five consecutive pieces plotted at every 2-hr. interval to indicate alternative conditions. Three sets of possible results are shown. (Only one of the three would be likely to result in any given situation.) The first set of results shows how a large within-unit variation would show up. The second shows time-to-time variation. The third shows unit-to-unit variation as the major contributor to undesired results.

The histogram—A less informative but often useful plot is the histogram, three examples of which are shown below. It was developed for statistical quality control, to show a pattern of results. It's a simple picture of results to put in the hands of foremen, supervisors, and operators so they can record and analyze attempts to improve an operation or a process and plan the next steps.

4. TRACK DOWN THE SUSPECTED VARIABLE

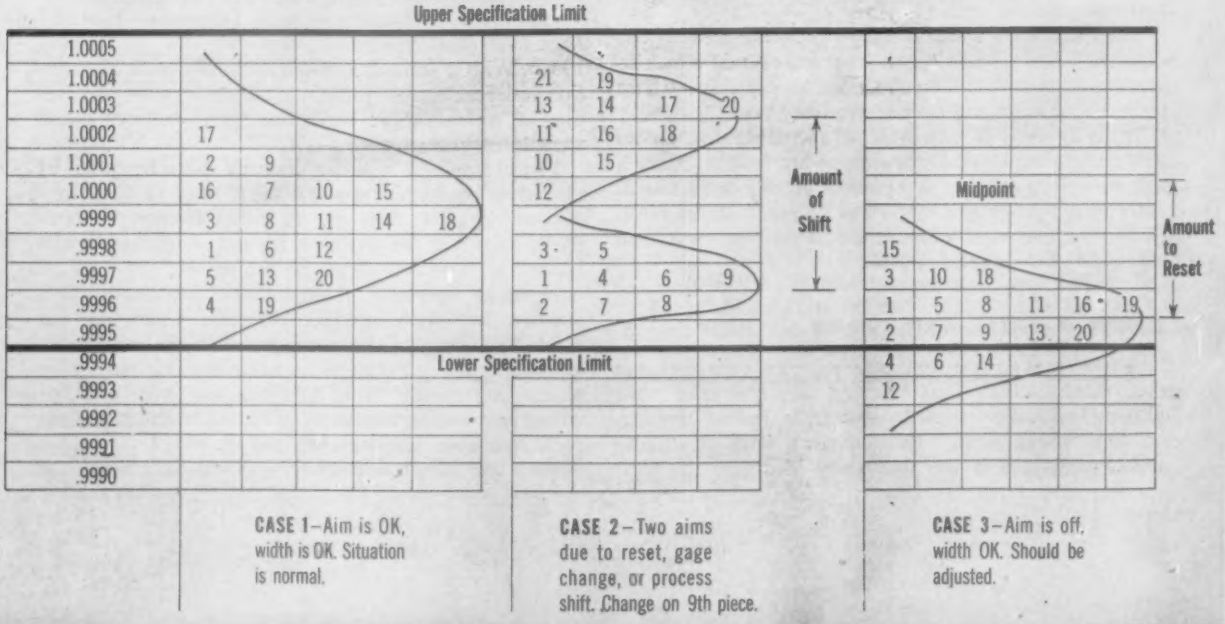
This step consists of some simple experiments with the one condition you suspect of causing the results in the Multi-Vari Chart or the histogram.

You can set the suspected variable at a number of levels to provide evidence of correlation with the results. In effect, it is a return to the common-sense approach. But it operates on fresh clues uncovered by the new graphing.

In using the charts at this stage to guide your trouble-shooting efforts, you should follow certain simple rules, as follows:

- Make a complete record of every change—and indicate when the change was made.
- Don't change more than one thing at a time. If you

HOW HISTOGRAMS SHOW RESULT PATTERNS FOR QUALITY CONTROL



do, you won't be able to isolate the change that causes the new result.

• After a change, get enough evidence and make decisions on the normal or settled-down condition. In machining, for example, don't make a decision on pieces made before the feather edge of the tool has worn off or before the machine has warmed up.

• Identify operator, machine, stock, part, gage, time, etc. Err on the side of too much information rather than too litttle for later analysis.

• Put enough thought into gaging and measuring techniques so you'll be sure you are properly measuring the variable you are investigating. Check gages often, be sure readings are accurate and consistent.

5. WATCH OUT FOR PITFALLS

There are some in the common-sense approach. But statistical aids will guard you against them. For instance, take a simple experiment with the effects of one variable. Suppose you want to see the effect of temperature changes on a given product—say, on its burst strength. You may try three levels of temperature, T_1, T_2, and T_3 —low, intermediate, and high—and subject 12 samples of test product to them, four to each level, with the following results:

	T_1	T_2	T_3
	4	7	6
	9	7	3
	8	6	3
	11	8	2
Average	8	7	3.5

The results at a given temperature don't agree—a situation that is not uncommon, especially if you are measuring results with sufficient sensitivity. They don't agree because usually there are other factors at work than the ones being measured, even though you took precautions to hold everything else constant. But where there is not too great a spread within individual columns, most investigators would be fairly confident of the averages for the three temperatures.

The pitfalls here are (1) not knowing how much confidence to place in the results if there is an appreciable spread for each temperature and (2) overlooking influences you didn't know about.

Granted that you took all these precautions: Took all samples from one production batch. Checked each piece for properties you knew could affect results. Used only closely similar pieces. Even so, there are always other properties about which you know nothing—and they might have an important effect. If the first four came from the top of a pile, the next four from farther down, and the last four from below those, a trend in that unknown property could be the main reason for the average going from 8 to 7 to 3.5.

"Randomization" and "replication"—You can avoid such spurious correlation. For this, Sir Ronald Fisher some 30 years ago gave us the concepts of "randomization" and "replication." Number the 12 test pieces 1 through 12 and put the numbers on separate cards. Shuffle the cards thoroughly. If the top card is now No. 8, assign test piece No. 8 as the first one to be subject to temperature T_1, following the pattern of the table half way up this column. If the next number is 3, assign test piece No. 3 to the second place under T_1, and so on, assigning 4 pieces at random to T_1, the next random 4 pieces to T_2, and the last 4 to T_3. (A statistician's table of random numbers is usually used for this purpose instead of cards.)

What have you accomplished by mixing up repeated trials under each temperature? If some important property is not alike among the 12 pieces, you have distributed it at random, forcing it to cause a roughly equal lack of repeatability—a spread in readings among the results within each column. If there is no such important property, the randomization achieved nothing—but was good insurance.

You can see that with this precaution, good repeatability within each column and significant differences among the averages for the temperature level mean you have a real cause and effect due to temperature, no matter what differences in other respects exist among the test pieces. On the other hand, poor repeatability within columns and a small difference among the averages mean one or more material properties are having a much larger influence than temperature.

Whenever there is some difference within the columns, it's possible the effect you got was due to pure chance —some uncontrolled property other than temperature. What are the odds that you are right in ascribing the result to temperature? You can use statisticians' tables of odds this way: First, determine a ratio that expresses (in the numerator) the differences among the averages, and expresses (in the denominator) the spread, or lack of repeatability, in the values for each temperature level. Then check this ratio against the table (called "F table" after Sir Ronald Fisher) to find the percentage probability that the result is due to chance. If the figure is low, you can conclude the temperature is causing the effect.

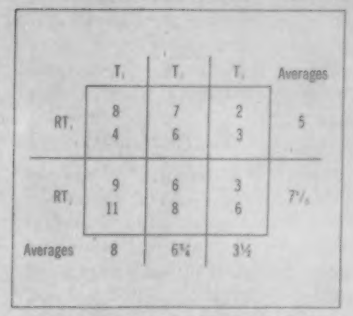
Sir Ronald also developed guards against another pitfall—unsuspected effects of time. In the example, four randomly selected test pieces are first exposed to T_1. Then the furnace is brought up to T_2 and four more test pieces are exposed. Finally, the last four are treated at T_3. Because they have been waiting longer, these last four could—unnoticed—have a more oxidized surface, say, than had the first four, just before they were placed in the furnace. Or the calibration of the temperature instrumentation could be drifting with time. Humidity, equipment wear, human learning, even fatigue are representative of time factors that could influence results to a considerable degree.

Here again you may use randomization. Twelve numbers, in random sequence, may call for the first test (with one of the pieces previously allocated at random) to be run at T_2, then one at T_1, two at T_3, one more at T_1, etc. In other words, the temperature sequence as well as the piece sequence is now at random.

At this point your laboratory technician will be upset, because it takes a half hour to bring the furnace up to the temperature level each time. "Why couldn't we have run all four pieces at once when we had a given temperature?" would be his question. You would have to explain that you were doing everything to guard against anything but temperature accounting for the difference among average results.

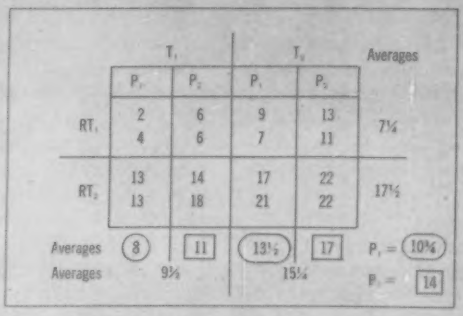
Turn the page

HOW "FACTORIAL DESIGN" ANALYZES DATA ON TWO OR MORE VARIABLES



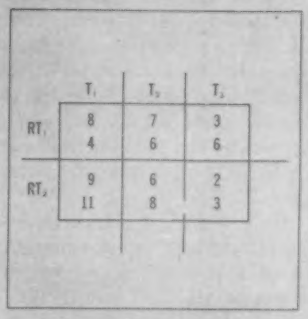
	T_1	T_2	T_3	Averages
RT_1	8 4	7 6	2 3	5
RT_2	9 11	6 8	3 6	7⅓
Averages	8	6¼	3½	

Factors: Temperature and Reaction Time



	T_1		T_2		Averages
	P_1	P_2	P_1	P_2	
RT_1	2 4	6 6	9 7	13 11	7¼
RT_2	13 13	14 18	17 21	22 22	17½
Averages	(8)	[11]	(13½)	[17]	P_1 = (10¾)
Averages	9½		15¼		P_2 = [14]

Factors: Temperature, Reaction Time, Pressure



	T_1	T_2	T_3
RT_1	8 4	7 6	3 6
RT_2	9 11	6 8	2 3

Interacting Factors: Temperature and Reaction Time

6. ANALYZE MORE THAN ONE SUSPECT

Where there is substantial evidence that two or three variables are involved, you can evaluate them simultaneously by using a so-called "factorial design" to analyze your test information. Suppose, for example, you want to introduce another suspected factor, say reaction time, and study it along with temperature. Still with 12 total test runs, you can study the separate effects of each factor from the design shown at top left, in the illustration above.

Any influence of the reaction time (RT) on the three vertical averages has been balanced out. The first average, 8, has in it the effect of two tests at RT_1 and two tests at RT_2. So also do the second average (6¾) and the remaining one (3½). Similarly the effects of temperature have been balanced out between the two horizontal averages (5 and 7⅓). It is apparent that going from RT_1 to RT_2 has 2⅓ units of influence, and going from T_1 to T_2 to T_3 has 1¼ and 3¼ units of influence, respectively.

There is a lack of repeatability in the pairs of results in each box, because of unknown factors. By means of the ratio and the "F Table" you can determine the odds that one factor, the other, or both have a clear cause-and-effect relationship with the results.

Full factorial design—This simple example of a designed experiment is called a full factorial design. That's because every possible combination of the levels of each factor is represented. Normally you're interested in the influences, separate and combined, of more than two variables. For a design for three variables, each measured at two levels, look at the middle design above. The main effects are evaluated by the averages: temperature, 9½ vs 15¼; pressure, 10¾ vs 14; and reaction time, 7¼ vs 17½.

The trouble is that the number of possible combinations shoots up as you increase the variables by only a few. For example, a full factorial arrangement of only five factors, for which measurements are taken at four levels for each factor, gives 1024 possible separate combinations. Getting readings for that many combinations usually brings in the difficulties of cost, time, mistakes, and test accidents of one sort or another that lead to missing data for some of the randomized runs. Granted, you can make certain mathematical allowances for a little of such missing data, but the analysis begins to get more complicated and less sensitive when you do so.

For such situations the recently developed "Random Balance," described in Step 8 below, is a powerful technique. But first you should consider Step 7, which is often profitable.

7. LOOK FOR INTERACTIONS

Information on interactions is a bonus obtained from factorial-design analysis. In the reaction-time and temperature example, this would concern the extent to which responses to temperature change are not parallel for the two levels of reaction time.

Assume test results like those at upper right. Going from RT_1 to RT_2, results increase under T_1 and T_2, but decrease under T_3. Apparently there is interaction as temperature and reaction time increase. It is not true here that temperature effects can simply be added separately to effects of reaction time.

Again the statistical engineer uses the "F" tables to give the percentage probability that the result is due to chance rather than to an interaction.

Go back to the middle design above. You can evaluate the interaction of reaction time with temperature with pressure by comparing the 8 averages of the cells (i.e., 3, 13, 6, 16, etc.) to find noticeable departures from parallel results. Next you can evaluate the temperature interaction with reaction time by comparing four averages—the four quadrants of the whole design (i.e., 4½, 14½, 10, 20½). Similarly you can evaluate temperature-pressure interaction and interaction of pressure and reaction time.

Detection of significant interactions often is the most important contribution of factorial design runs. You can't find interactions when you change only a single factor from test to test. And to explain the magnitude of the response in terms of causes, you must try more than one level of two or more factors.

8. APPLY "RANDOM BALANCE"

This technique was developed about three years ago by Dr. Frank Satterthwaite. It's a way to handle a great many factors simultaneously, with only 30 to 50 test combinations.

How can such a relatively small sample tell much

HOW "RANDOM BALANCE" WILL ANALYZE 30 TESTS ON 8 VARIABLES

TEST RUNS	VARIABLES I	II	III	IV	V	VI	VII	VIII	TEST RESULTS
1	L	M	L	L	L	H	M	L	32
2	M	M	H	H	L	H	L	M	18
3	M	L	H	L	M	L	M	H	26
4	H	H	M	L	L	M	L	H	28
5	L	L	H	H	M	H	L	H	19
30	H	H	M	H	L	M	L	H	15

about the thousands of possible test combinations that would occur in a full factorial deisgn? The answer lies, again, in randomization—in thoroughly mixing up all possible combinations before sampling. Here the size of the sample in relation to the whole "population" is not very important. The principle is the same as that of a doctor taking a small fixed sample of blood for his tests. No matter how big or small the patient is, the doctor knows that the heart has thoroughly mixed the blood and that he will learn as much from 5 cc. as from 10 or 100.

In Random Balance the effect of thoroughly mixing up many variables before choosing a sample is achieved by a process already described—assigning numbers to the variables, then mixing the numbers. An example will make this clear:

The chart at the top of this page shows a Random Balance layout for 8 variables, each one of which enters the experiment at three levels: low (L), medium (M), and high (H). Thirty tests are to be run. (A full factorial design for this would involve 38 combinations, or 6561—admittedly an unwieldy number.)

This example is based on a specification problem a company had in extruding plastic pipe. The critical spec was the burst strength of the finished pipe. Variables thought to have a possible effect included feed-screw speed, feed-screw temperature, sizing mandrel, and similar factors.

Problems of this sort could come up in many operations, where quite a few variables might be involved. For example, cutting-tool life can be influenced by such variables as feed, cutting speed, depth of cut, machinability of material, type of tool steel, back rake angle, nose radius, amount and type of coolant, and others.

In our 8-variable, 30-test example a set of numbers between 1 and 30 is chosen from a statistical table of random numbers. The low value L is assigned to Variable I in the test runs corresponding to the first 10 of these randomly chosen numbers. For Variable I the next 10 numbers get M, and the last 10 get H. As you can see from the chart, the L's, M's, and H's are thus in random sequence under I for the 30 tests. The same procedure is repeated for Variable II, with random numbers between 1 and 30 chosen from another portion of the random table. Then the same procedure for Variables III, IV, etc. The result is 30 sets of combinations of various levels of each of the 12 variables, completely randomized.

The first test combination to be run was I at L, II at M, III at L, IV at L, etc. When run, it gave a measured result of 32 units. The second test run, another random combination, gave 18.

Analysis: plotting each factor—If you make plots of each variable against the test results, you'll see something like those in the table on the next page.

The vertical scatter about the average response line is a measure of the effect of everything except the variable on the horizontal scale plotted on that particular chart. The combined influence on Variables II, III, IV, etc., causes the lack of repeatability, or scatter, in the chart for Variable I.

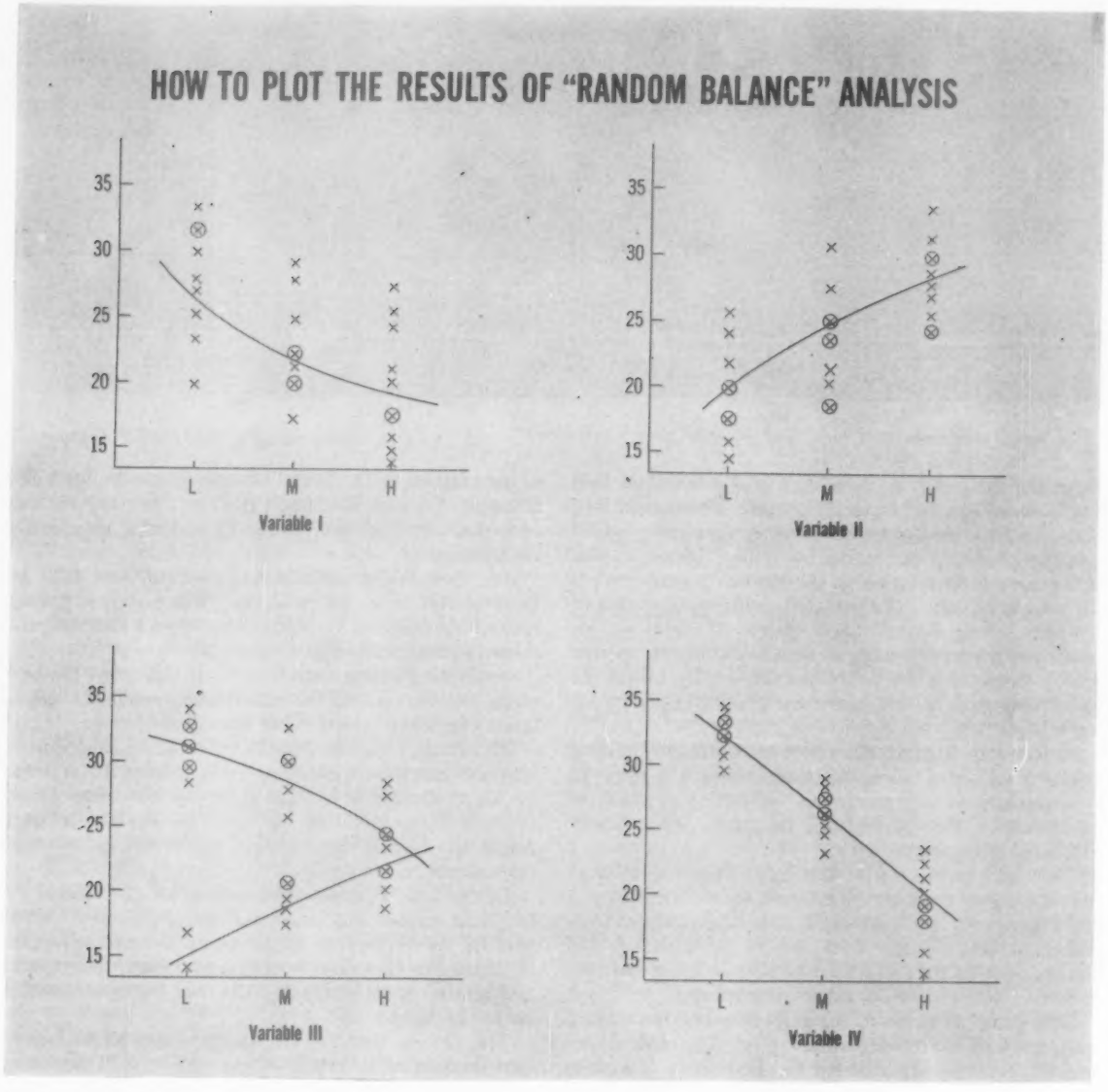
Of the four variables shown, the plot of Variable IV has least scatter and steepest slope of response. Variable IV must therefore be the one with most influence. (If there are two equally strong variables, they would add scatter to each other's plots, but slopes would still be pronounced.)

The plot of Variable III strongly suggests an important interaction, because of the non-parallel response. If two plots show this situation, there may be a two-variable interaction. If three show it, a three-variable interaction, etc.

Note that the Random Balance method provides clues that you can confirm by a small-scale, exact-balance factorial experiment with the leading variables revealed by the Random Balance analysis. It's a sampling process that makes it possible to manipulate the original large number of variables, which could not have been handled by other methods.

Discounting the predominant factor—Because you can't have an exact balance layout with your sampling procedure, the effect of the predominant factor (Variable IV in the example) will influence the other plots. If you wish to, you can remove its influence from the other plots as follows:

Rotate the response line for Variable IV about the grand average of all 30 results as a fulcrum, until it is horizontal, taking all the points at L down with the line, and all points at H up. (Those at M will not change



position noticeably.) Now each of the points represents a result corrected for the effect of Variable IV. When they are replotted for Variables I, II, III, V, VI, etc., they will show less scatter but will evidence some change in slope.

Do the replotting as follows: Go back to the Random Balance array (top of page 89). Wherever Level L appears there for Variable IV, subtract its average adjustment, just obtained, from the test result in that line. Wherever Level H appears for Variable IV, add its adjustment to the test result in its line. As a result, 10 values in the last column will be lowered and 10 will be raised. Now replot Variables I, II, and III with the corrected results.

You can now see the next most influential variable after Variable IV. This type of adjustment can be continued as long as practical.

ENTER THE STATISTICIAN

By now it must be obvious that as the statistical techniques increase in complexity, so does your need for specialized assistance. The several methods illustrated here are generally in the realm of the amateur. There are many others, however, that are not. Consequently, it would be unwise to limit your range of statistical tools by lack of statistical skills.

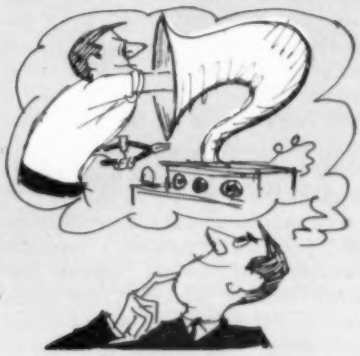
Plant operations might well benefit from the application of another significant cause-and-effect detector. It is called "Evolutionary Operation." This method employs progressive determination of combinations of factors that produce increasingly better results. This particular technique (although complex mathematically) is especially helpful where number and range of variables are great.

Five key rules that will make you a better talker

1. Organize your thoughts.

2. Speak in a pleasant voice.

3. Look good as you sound.



4. Eliminate the static.

5. Quit when you're through.

How to Talk—and Listen—Better

You've gotta do both—and do 'em well—to communicate. So here are tips from a plant man who makes an art of plain talk and smart listening.

PRODUCTION Supervisor Hiram Googins asked his boss at XYZ Manufacturing Company how likely it was he'd get the new milling machine he'd asked for. Here's the evasive answer he got:

"I'll be able to tell you something just as soon as we're out of the readjustment phase of reorganizing resulting from protracted negotiations among those involved in finalizing our readjustment plans. Do I make myself clear?"

Googins was confused. And so—whether he admitted it or not—was the speaker, Plant Manager Finnegan. So cagey was Finnegan trying to be that he only emitted a dense cloud of fog in response to a direct question.

This sort of confusion is all too common in today's plants. And a great deal of it is due to insufficient grasp of what the manager's role really is. Chances are, most managers simply don't know how to carry on face-to-face communications. Yet this man-to-man talking is the toughest measure of your effectiveness as a manager. You spend over 40% of your time talking. High time you did the job right.

The man in control of himself makes the most of every man-to-man contact. He influences others far out of proportion to the time he spends in face-to-face contact. But oral communications often are so weak that they cancel out more than 50% of the desired impact. For Manager Finnegan, it's close to 100%.

The difference in impact lies in the person-to-person techniques a

By JAMES H. MORRISON
Training Program Director
Western Auto Supply Company
Kansas City, Mo.

Begins on page 91

"Wait until you have heard your man out...

man uses—or ignores. There's no set of techniques you can learn in leadership conferences or in speech class. Mass communications have little to do with the specialized tools of personal communications—with talking. Talking face to face is an art few managers take the trouble to refine. Many don't even know it exists.

A great deal of the static generated by conversation arises from one man annoying another by his mannerisms of speech. Avoid annoying mannerisms and you'll be a long way toward effective conversation. Simple to say but difficult to do. Here then are 5 commands and 20 tips on half of the job—being a good talker. Later we'll list 4 commands and 14 tips on the other half of the job—being a good listener.

LEARNING TO TALK

Here are the five commands you must obey for better talking, plus tips for each command:

1. Organize what you say—Probably the most common cause of a breakdown in communications is the failure to give thought to what you say. Words flow so easily that it's often difficult to keep them orderly—difficult to subject them to the discipline of your mind.

Whether you want to express facts, opinions, or ideas, be sure to keep the sequence logical. Start with the simple, build to the complex. Connect the links with strong bands of logic.

• Don't ramble. Rambling is for roses or nonagenarians. If you get off the subject you're admitting you can't or won't keep your mind on what you started out to say.

• Choose words to fit the occasion—and your listener. If you're talking to a hod carrier, keep your words simple. If it's to a foreigner, speak slowly but not condescendingly. If it's to your boss, speak directly and clearly. When choosing your weapon of words, make sure you understand what you're trying to do. Do you want to inform, persuade, or inspire action?

• Shun the shotgun approach. You can't be all things to all men. Talk that hits the target with one person may put another to sleep. Tailor what you say to your audience—and always give your listener credit for being a bit smarter than you think he is.

• Don't be afraid of repetition. First state your point. Then give your reasons for it. Give an example. Finally, summarize your point with different wording from what you have already used.

2. Deliver your message—Put bounce in your voice. Vary your volume, your inflection, your delivery. Nothing stirs up interest more than an enthusiastic lilt to what you're saying. Try eavesdropping if you don't believe it. Don't you find yourself immediately interested in what someone is saying if he sounds excited about it?

• Be articulate. Let the words come like polished gems—each carefully finished and distinct. Speak low when making whoopee, not when conducting business. A low voice will oblige your listener to strain to hear you. And he might think you're so weak you might expire on the spot.

3. Look as good as you sound—You may have heard it before, but it still bears repetition: 85% of what you learn comes in through your eyes, while only about 7% comes in through your ears. That's why you should remember the importance of what a person sees as well as what he hears.

• Smile. Nothing better reflects your interest in your listener than a pleasant expression, especially if you intend your words to be friendly, helpful, or sincere.

• Save the poker face. What's good for the card table is bad for conversation. An expressionless face gives you all the emotional appeal of a cold marinated herring.

• Look 'im in the eye. If you want acceptance of your statements, nothing works like a direct lock on his eyes. Keep your face muscles relaxed, try to look confident.

• Avoid St. Vitus. Shifty, nervous facial or body mannerisms accomplish nothing except to make the hearer annoyed, cause him to distrust what you're saying.

4. Eliminate static—Static is any element in conversation that obscures the message, causes distortion, or reduces understanding.

• Keep your voice calm. Raising your voice when you're excited or angry is a sure way to make the other person excited and angry.

• Qualify your opinions. Say "To me" or "I think" before stating an opinion. Stating your opinions as facts is one of the most antagonizing habits of conversation.

• Don't use vulgarisms. If your language won't stand on its own merits, no amount of curses or four-letter words will buck it up. Only hardened people fail to resent vulgarisms.

• Express, don't impress. Language full of ornate phrasing won't impress anyone. Strange to say, the person who spends his talking time trying to convince others that he is the important man usually succeeds in conveying just the opposite impression.

• Be peaceful. Even if it's a habit of yours, a belligerent tone of voice inevitably arouses a fight response in your listener. An aggressive personality makes a fine top sergeant, but a brassy conversationalist.

• Don't forget the "we." When you differ with another's opinion, hold your fire. Say "Are we sure *we* have all the facts?"

• Don't say "you're wrong." Nothing will choke the channels faster than this communication killer. "You're wrong" is a phrase sure to turn a conversation into an argument.

• Look for good points. Ask yourself what positive things your listener can possibly contribute. If you conclude that he has nothing to offer, your tone of voice will betray you—and you'll get nothing.

• Keep your troubles to yourself. If you're miserable about your job, your marriage, your golf score, keep it to yourself. The constant complainer creates more problems than he solves.

• Try another tack. If you seem to be unsuccessful in making your point, keep trying, but this time take a new approach. Don't try the clam treatment if you're upset. No problem gets solved in silence.

the ideas yet to come may be the clinchers."

• Clean out your rubbish. Ponderous "er's," "uh's," and "well's" detract from your meaning.

5. Quit when you're through—The man who knows when to stop is the orator. The man who drones on is the bore. Recognize the golden time for silence. After a certain amount of information has passed, your man needs time to respond. He needs absorption time if your ideas are to become his ideas.

• Boil down what you want to say. Don't overtalk unless you plan to make your point by hypnosis.

• Don't be a parrot. When you want to reinforce what you've already said, use new and different phrases. Repetition only dulls the point.

• Share the time. If your ego needs satisfaction there are far better ways to satisfy it than to hog the conversation. The hog finds himself alone at the trough.

LEARNING TO LISTEN

The four commands (plus 14 tips) to make you a good listener:

1. Listen, and act like it—Turn on that 24-karat smile and spring the glass stare on him and you'll fool just one person—yourself. You have to react with something more convincing than that if you want to prove you've heard.

• Demonstrate by answering. When your man is through, mention things he's just said, or otherwise indicate that he's got through.

• Don't be oblivious. If you haven't heard what he's said and don't care whether he knows it or not, you've broken a basic rule.

• Keep your mind on it. The annoying habit of asking the speaker to repeat what he has just said indicates you are a slow thinker, a graceless oaf, or are hoping to gain a little more time so you can get your brain warmed up.

2. Listen and look like it—The major importance of looking interested is to reassure the speaker, to make him feel secure. This will give him confidence that none of his valuable ideas will be wasted.

• Keep your eyes on the speaker. The shapely calf may be a good excuse for interrupting your own thoughts, but not another's. If your eye roams you'll slow things down.

• Look encouraging. Your facial expression is like a magnet. A continual frown or a suspicious look cramps and inhibits the speaker—repels his ideas. The same goes for repeated movement of your lips (as if you can't wait to break in).

3. Listen and understand—Hearing without understanding is like conducting a conference in Latin—useless.

• Analyze facts, feelings, purposes. Give the speaker's words the same mental treatment that you give your own. Be analytical, sympathetic, optimistic.

• Don't listen just for words. The words alone mean nothing. It's what they amount to as a group that gives meaning to what your man is saying. His thoughts are complex. Give them the right attention.

• Listen for ideas. From his specifics you may be able to erect more significant generalities. Ideas beget ideas. But it takes an attentive ear to gather all the facts plus the ideas behind them.

• Put yourself in his shoes. Try to see the situation the way he sees it even if it's an uncomfortable experience. Nothing will broaden your own outlook more than a sincere effort to understand his.

• Don't be an ox. Your capacity for sensing subtle points in what the other man says is directly linked to your attentiveness. If you are insensitive you open a gaping chasm between you and you make the day of genuine understanding doubly remote. Two men who are sensitive to each other's needs and methods of thinking can accomplish far more than two strangers or two mere business acquaintances.

4. Listen completely—If you go off half-cocked your efforts will be misdirected and ineffective more often than not. It's bad enough to act quickly on insufficient information when you can't help it. But it's stark tragedy when it could easily have been avoided.

• Suspend your judgment. Wait until you've heard your man out before you bring in your verdict. The ideas yet to come may be the clinchers. Every plant has its idea-jumper—the man who thinks he needs only the first words to fill in the blanks. After listening half-way through, he breaks in to give an authoritative answer, based on equal parts of ego and thin air.

• Don't interrupt. One of the most common forms of discourtesy is to break in to complete a sentence for the speaker. This kind of activity is called hitchhiking. It's about as effective in communicating ideas as hitchhiking on the trans-Afghanistan highway is in transporting people—gets nowhere at all.

• Be reasonable. An open, receptive person is the ideal person to talk with. Be one if you can. Act like one if you can't.

In summary, to be the most effective talker you possibly can be, remember to:

• Organize your thoughts.
• Speak in a pleasant voice.
• Look as good as you sound.
• Eliminate the static.
• Quit when you're through.

If necessary, run down this list mentally before you open your mouth. And don't be afraid to take plenty of time to marshal all your thoughts—and your poise—before you begin talking.

To be the most effective listener you possibly can be, remember to:

• Act as if you're listening.
• Look as if you're listening.
• Understand what you hear.
• Take in all that the speaker says.

And then keep in mind the one overriding rule that holds in any man-to-man conversation: BEFORE OPERATING JAW, MAKE SURE BRAIN IS ENGAGED.

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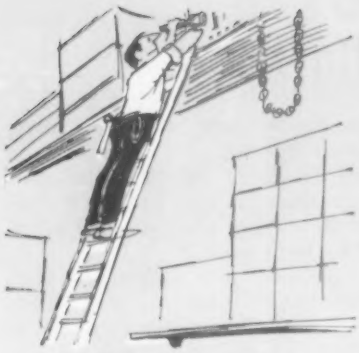

1. Minimize handling.

2. Carry a big load.

3. Put it where it's handy.

These six cardinal rules (above) will be your hottest tips on . . .

How You Can Hit the High Cost of

High time you probed those neglected opportunities for rich savings in this little-explored field. Du Pont did—and came up with welcome cost cuts.

HOW MUCH do you think an average trip by a maintenance man to a nearby storeroom costs? It's likely to cost just about $1. Multiply this by hundreds of similar errands for forgotten whammits in a week and you can see why we should take a close look at materials-handling costs in maintenance.

We know that as high as 75% of our construction labor dollar goes for handling materials. Since maintenance operations are somewhat akin to construction, we have good reason to believe a sizable part of our maintenance labor dollar goes the same way. Therefore any effort to improve our materials-handling practices in maintenance should prove worth while. This conclusion has led to close liaison between our maintenance and materials-handling engineering forces in studying to improve maintenance operations.

What's the payoff? We don't exactly know. Other simultaneous improvements prevent accurate evaluation. But a constant hacking at the problem has uncovered many opportunities for lowering maintenance manpower costs. You'll see how the man-hour potentials are many and big with our program.

Biggest payoff, however, is likely to be in another direction—saving downtime on a production unit. When such downtime runs upwards of several hundred dollars an hour, you can realize why every hour cut from total repair or overhaul time by better materials handling justifies its exploration.

BY JOHN D. WRAY
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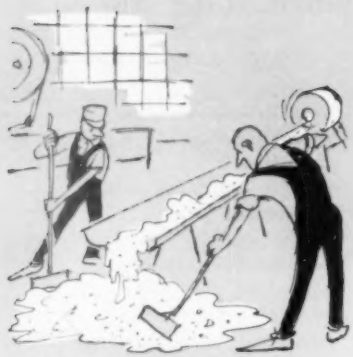
Engineering Service Division
E. I. du Pont de Nemours & Company
Old Hickory, Tenn.

PREDICTING IMPROVEMENT

No matter what your plant size is, you can weigh your chances of improvement in 10 minutes. Just answer the following 10 questions. They represent the cardinal sins in materials handling in maintenance. They are clues to how well or poorly you are doing in this field.

1. How often do maintenance workers stand idle at the job waiting for delivery of materials or tools?
2. How much time do your skilled maintenance workers spend in moving materials?
3. Do you need a large yard-labor gang for maintenance work?
4. Do your men have to carry heavy loads, say over 40 pounds, for any great distance?
5. Are men handling single pieces where unitized loads (palletized, banded, boxed) are easier?
6. Are men continually doling out material from large to small returnable containers?
7. How much equipment or material is damaged in maintenance for lack of proper handling equipment?
8. Do shops and storage areas allow easy in-and-out movement?
9. Are helpers on jobs used mostly to fetch and carry materials?
10. Does maintenance have its own materials-handling equipment, or does it have to beg, borrow, or steal from other shops?

In answering these questions, guesswork won't do. If you don't know the right answers, it will pay you to find out. This is not difficult—you can do it by work-sampling techniques. Aim the study particularly at developing facts on materials handling. For example, how much time do maintenance men spend in travel and transport? How much time in waiting for supplies or tools? How much time in removing machinery or equipment from position and lifting, transporting, and replacing it into position?



4. Combine jobs if you can.

5. Avoid set-down, pile-up.

6. Mechanize delivery.

Handling in Maintenance

In each case also note the method being used—whether by muscle and brawn, by hoist or pull-chain, by fork-lift truck, trailer, crane, or other available mechanical means. And don't overlook how the men themselves move. Do they walk or ride? Do they have to climb regularly to high or hard-to-reach places? Do they have to tug a welding machine from one end of the plant to the other? I know of a plant that justified the purchase of several maintenance welding machines, spotted in strategic areas, by the man-hour savings in hauling time.

SETTING UP A PROGRAM

This article started somewhere toward the middle, to help you see the savings a materials-handling study can bring you. But for best analysis and appraisal of your actual conditions, let's start with a review of fundamentals.

In the generally accepted definition, materials handling is a wide field encompassing handling, packaging, warehousing, and distribution. In a sense these same functions deserve attention in maintenance—the study of movement, load size, storage, and disbursement of maintenance materials and supplies, and of machinery and equipment for servicing or for being serviced.

To study materials handling in maintenance you should begin with four objectives:

1. To deliver material at the spot on time. If too early, it might be in the way. If too late, job cost is higher, downtime penalties are greater.

2. To deliver it to the right spot. If too far away, it may need rehandling. Various sources estimate it costs about $300 per man per year in some construction activities to procure materials 25 to 50 feet from the job.

3. To deliver it in the required amount for the job. Remember, it costs about $1 for that short trip to the storeroom for an extra length of conduit.

4. To deliver it packaged in a form most easily movable and usable, as well as most indestructible. For example, can you purchase concrete block on a pallet that can be rolled with a pallet truck directly to the mason?

Six basic rules for handling—Achievement of the four objectives isn't enough. The amount of manpower or type of method used in handling may yet be too costly. For example, the traditional roller-and-pry method of moving a machine may still be okay for a 10-ft. move. But not for a move all the way from the production area to the repair shop. In short, are you doing it the cheapest way? Here are six basic rules (cartoons above) for checking the cost angle:

1. Eliminate the need for any handling at all, if you can. For example, if a man needs a ladder to service an overhead facility each week, why not provide a permanent ladder on the spot?

2. Handle as many pieces as possible in each move. For example, when you plan a job determine the various materials and tools needed. Then move them to the site on a flat-bed trailer rather than have each craft independently transport its own materials and equipment.

3. Place material where it can be reached without extra work. For example, why not keep a supply of pipe fittings, bolts, nuts, and the like, on a small bin-equipped trailer that can be moved from job to job. This saves handling into and out of stores as well as travel time to and from stores.

4. Combine operations — either two operations at the same time or two operations at the same place. For example, in unloading a concrete mix for pouring a floor, arrange to spread it by chute over the area at the same time.

5. Move material from one operation to another without the intermediate storage that requires another set of pick-up and set-down moves. But don't place materials so close to the second operation that a

What You Can Use for Handling Maintenance Materials

Class of Equipment	Some Major Useful Types	Typical Applications
CONVEYORS	Belt, Carrier Chain, Elevating, Pipeline, Roller.	Skate-wheel conveyor to feed lumber to rotary saw.
ELEVATORS	Bucket, Incline, Shaft, Skip Hoist.	Dumbwaiter between two levels of storeroom.
INDUSTRIAL TRUCKS	Hand, Powered, Platform, Floor, Straddle.	Fork-lift truck to move heavy equipment around plant.
MAN LIFTS	Elevating Platform, Aerial Boom, Portable Extension Scaffold.	Mobile platform lift for servicing overhead plant lighting.
HOISTS, WINCHES, AND CRANES	Bridge, Monorail, Gantry.	Built-in chain hoist for maintenance on large compressor.
TRUCKS AND TRAILERS	Bulk, Tank, Flat Bed.	Fifth-wheel trailer as mobile storage platform.
STORAGE FACILITIES	Open-Front Bin, Stake Rack, Pallet Rack, Bar Rack.	Multi-level rack system for motor storage.
PORTABLE AND STATIONARY CONTAINERS	Tote Box, Skid Bin, Hopper, Silo, Drop-Bottom Bulk Container.	Stackbins mounted on trailer for issue of pipe fittings.
TRACTORS	Gasoline, Electric, LP.	Tow tractor to pull trailer train.
MOBILE POWER EQUIPMENT	Power Shovel, Wheelbarrow, Yard Cranes.	Powered scoop to remove scrap, debris.
SPECIAL-PURPOSE EQUIPMENT	Unloader and Dumper, Wheeled Cart, Jack.	Set of roller skids for shifting heavy equipment in shop relayout.

penalty of interference outweighs your savings in handling.

6. Use the best mechanical means available to deliver, move, or take away materials. Mechanical power can far outperform manpower in shoveling, lifting, pushing, and carrying operations. For example, a certain plant had to clean out a process sediment pit periodically. It used to do this first by hand shoveling, later by manually directed draglines. Now the job is done fast and efficiently by a continuous automatic screw conveyor that empties into transportable bulk containers.

Six Spots to Probe for Improvements

Why six? Because there are six major activities in maintenance work involving material movement: planning the job; receiving the material; layout of shop, stores, and toolroom; movement of materials; performing the job; and worker communications. In every one of them application of modern materials-handling concepts can improve performance and cut over-all job costs. This goes for all trades across the board, including millwrighting, pipe-fitting, machining, metal fabrication, carpentry, instrumentation, and electrical work.

Before we examine these six phases of maintenance operations we need to know one more thing. What kinds of materials-handling equipment are available for maintenance work? Look at the list at the top of this page. It names the more important types used by Du Pont in production operations. To date about half of them have been applied to maintenance work.

Anyone who wants to engineer up-to-date equipment into maintenance operations must be familiar with the purposes, advantages, and limitations of all items on the market —and of new ones that keep coming up. He must know which items are useful for conveying, transporting, hoisting, palletizing, unitizing, and storing. Only then can he evaluate, test, specify, develop, design, and select the equipment that's best suited for the job.

But we have learned, as in production operations, that you don't solve materials-handling problems in maintenance solely by the use of new equipment. It's broader than that. You have to select equipment that does the most good for the most jobs. Yet sometimes you'll find that a special type for one highly repetitive job may pay for itself within 6 to 12 months. How do you find out what you should do? Once you are clear on your four basic objectives of getting the right material in the correct quantity to the right spot at the right time, you analyze every move in the light of your six rules for efficient handling. Even further, you analyze not only the move itself, but what preceded it—initial planning of the job, purchase of the materials, delivery to the plant, and so on down the line.

This leads us now to an application of the six rules for efficient handling to the six phases of maintenance activities that affect every maintenance job.

1. PLANS FOR THE JOB

If you forget every other rule in this article, here's one that will always ring the economy bell: Plan every move before you make it. Adopt a watchdog attitude toward every materials move, whether it involves construction materials, parts or supplies, operating equipment, or maintenance tools or equipment.

Planning must start with design (if you make the object) or with requisitioning (if you buy it). It's too late to plan after the material is on the job site. Let's look at design. Do your equipment designers and engineers consider how their crea-

tion is going to be maintained? Does the equipment need extensive dismantling of heavy parts—perhaps even transport to a central shop for periodic overhaul? Will modular or plug-in units help cut movement and transport?

Extra care in requisitioning materials can pile up maintenance man-hour savings. This involves more specific purchasing, more effective inspection procedures, and better scheduling of deliveries. Instead of just ordering a load of bricks, for example, you might spell out how those bricks should be loaded on the common carrier to speed their handling off the carrier and into storage or use. Or did you ever think, when ordering crated equipment, to specify maximum dimensions to be sure it would pass through the doorway? As for inspection, did you ever haul a heavy pump or motor from the storage area only to find it was damaged in shipment or didn't match specifications? Sometimes inspection of new equipment at the vendor's plant will help you anticipate your handling problems.

Careful delivery schedules can eliminate multiple handling, perhaps the largest contributor to handling costs. The ideal is to unload directly from carrier to point of use or installation. Of course, you can't always do this because of other factors, such as shop fabrication. But it can be profitable if your shipments are large.

For example, here's a process-gas drying tower in an acid plant in which a low-density bulk packing material needs periodic replacement. It amounts to some 500 pounds of packing at each change. Proper scheduling brings the highway trailer to the job at a time when it can be unloaded directly into the drying tower. This saves unloading into stores and rehandling to the tower platform.

Suppose you have a large piece of equipment that needs a frequent oil change of large volume. You can cut your handling costs by scheduling bulk delivery (or drum lots) direct to the job location, rather than by receiving it ahead of time in the plant storeroom. All these examples emphasize one major point: The opportunities for direct point-of-use delivery are ripe for picking in any manufacturing plant.

How Du Pont Cost-Analyzes a Typical Maintenance Handling Problem

PROBLEM

A plant receives 2000 boxes per year of various maintenance materials. Unloading facilities are 200 feet from points of storage or use. At present, stores employees transport boxes one at a time to storage.

PROPOSAL

Purchase pallets and a hand pallet truck to move boxes. Materials can be stored, indiscriminately mixed, on pallets. Box dimensions permit average load of 8 to a pallet. A pallet will be spotted at the unloading point, moved only when it has accumulated 8 or more boxes. Are we justified in adopting this system?

COST ANALYSIS

1. Amount of material received:

2000 boxes per year = 40 boxes per week
8 boxes per pallet = 5 pallets per week
Assume materials remain in stores 2 to 4 weeks.
Number of pallets needed (4 weeks) = 20 (in stores)
5 (current week)
25 total

2. Distances traveled; man-hours required:

Labor cost	$1.50 per hour
Man's walking speed	3½ miles per hour
Present cost of carrying one box 200 feet	$0.16
Cost to move 1 pallet 200 feet	$0.16
Cost to palletize 8 boxes	$0.20
Total	$0.36
Proposed cost per box $\left(\frac{36¢}{8¢}\right)$	$0.045

3. Proposed investment cost

1 hand pallet truck	$100
25 pallets	125
Total cost	$225

4. Annual operating cost summary

	Present	Proposed
Labor, 2000 boxes at 16¢	$320	
Labor, 2000 boxes at 4.5¢		$ 90
Truck maintenance at 10%		10
Pallet maintenance at 15%		19
Truck depreciation at 20%		20
Pallet depreciation at 33%		42
Total	$320	$181

5. Savings

$320 − 181 = $139

Return on investment = $\frac{\$139}{\$225} \times 100 = 60\%$

Payoff period = $\frac{\$225}{\$139} = 1.6$ years

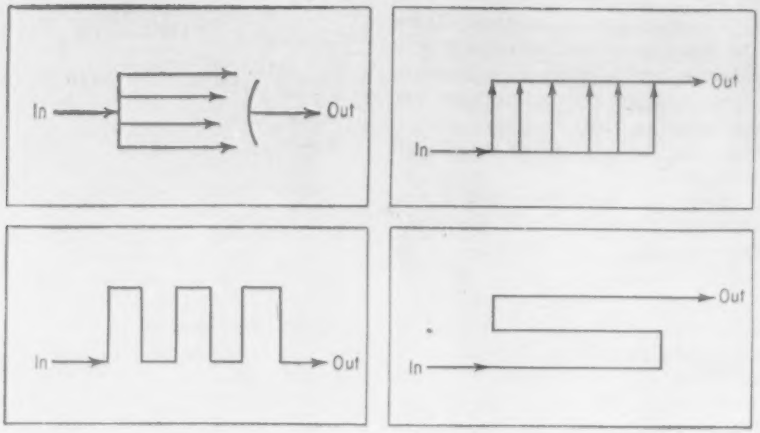
2. RECEIPT OF MATERIAL

The way material is received at the plant can cut the handling percentage of the maintenance dollar. First rule: Make sure you can handle your material the way it arrives. You don't order pallet loads, for example, if you have no pallet handling equipment (see hypothetical example above). You do order lumber banded into a unit package, say 3000 pounds, if you're equipped with yard or overhead crane to pick it off the flat car or truck.

But this approach limits you to planning your moves with equipment you've got. Perhaps you should invest in some new materials-handling equipment that would improve your method, hence the cost, of receiving and distribution. How do you find out? You make a detailed analysis of the mode of receipt of all repetitive maintenance items. These might be materials such as steel plate, floor grating, piping, valves, welding rods, reconditioned motors, and the like. How much of each item do you get yearly? How much time is spent in handling it?

Take steel plates. How many tons

Four Basic Work-Flow Patterns That Banish Backtracking



a year do you have to move? How many feet do you have to move it? What equipment do you use? Suppose you erected some racks for steel plate in a new Location X. And suppose you bought a special attachment for a fork-lift truck you already have for handling steel plate. Instead of having to call in the bull gang, you'll now need only one man to get the plate into those new racks. How much money will you save with this improvement?

The pattern of analysis for any item is the same—it centers on facts. They cover amount of material received, distances traveled, man-hours consumed, and proposed investment cost; then operating costs of old and new ways and possible dollar savings. Perhaps your problem isn't steel plate, but just an unending flow of materials and supplies in boxes. The hypothetical study on page 97 shows you how Du Pont engineers would come to the conclusion that a pallet system of handling was justified for a given situation.

3. LAYOUT OF AREAS

Every extra 20-ft. round trip a stores clerk must walk to bring one item back to the disbursement window adds at least 4 seconds to his order-filling time. That is, if he's working at incentive pace. If you doubt this, check it against accepted predetermined time standards.

Two lessons are plain about stores and toolrooms:

• **Locate your stores or tool items by popularity.** Put the most often used items, when you can, close to the point of issue. Surprisingly many plants still store by alphabetical or numerical sequence. So they may be using an extra clerk to prevent window jam-ups. Or they may be winking at much longer window waits by skilled mechanics.

• **Store by ease of handling.** Keep heavy materials near the floor and reachable by handling equipment, light materials in upper storage spaces. These rules will cut time and effort in manual handling. But is all this manual handling necessary? Will mechanical equipment do it faster—roller conveyors, chutes, pneumatic systems, tiering machines, lift trucks, and the like? In fact, need the maintenance men travel to the storeroom at all? Perhaps an order-and-delivery service to the job site will utilize more of their productive skills.

Another field for eliminating useless steps is your maintenance shop layout. How does the work flow in and out? Many plants have specific recurring maintenance jobs, like retubing exchangers, which account for a large part of the maintenance bill. Do these jobs backtrack or leap-frog around the shop? Is the shop laid out for straight-through movement? (This doesn't necessarily mean straight-line, as you can see in the above schematic flow diagrams, which show typical good flow patterns to follow.)

The big sin of multiple handling is most likely to thrive in the shop. How many times, for example, are you transferring raw steel or machine parts coming in from the storeroom? Or rehandling equipment for overhaul from production areas from one type of hand cart to another? Will monorail or powered mobile equipment do this transferring in one move? Or something else? What you're after is to uncover repeated violations of good handling practices. They're the most likely to offer rewarding benefits.

Area maintenance—Nearly everybody is familiar with this concept—outposts of decentralized service and repair shops vs. a central shop. One of its big advantages is a saving in worker travel time. Usually the size of plant (in square feet) and the demands of particular equipment for vigilant or specialized maintenance are the deciding factors in a move toward decentralization.

But we don't need to limit this decentralization concept to efficiency in use of people. From a materials-handling viewpoint, too, area shops and storerooms have merit. For example, in one or more plant areas you may have large pieces of equipment that regularly are being moved a long distance to a central shop for overhaul or repair. Can you set up an area or specialized shop close by to handle this problem? Can you mount such equipment on wheels and tracks leading to service areas? (It has been done on large furnaces.) Better yet, you might "portable-ize" the machine tools that are used for repair—bring the smaller tools to the bigger job. Such tools are appearing on the market for drilling, grinding, shaping, resurfacing.

As for storerooms, portable partitions have long been available for temporary enclosure of maintenance supplies for indoor areas. But now you can obtain portable shelters for

outdoor exposures. They can be easily set up close to the job. Typical examples are the geodesic structures and the air-supported or pneumatic shelters.

Du Pont engineers have found the pneumatic shelter a first-place contender for low cost where portability and ease of erection are desired. The pneumatic shelter will keep your cement bags dry as a bone for a year. And it will keep the weather off your tools. You can fold it and whisk it away for easy erection elsewhere at any time.

What It Takes to Justify New Equipment*

Type of Equipment Proposed	Weekly Time Savings Needed
1 fork-lift truck	12 man-hours
1 pallet	1 man-minute
1 trailer (farm type)	15 man-minutes
1 tractor (farm type)	4 man-hours
1 yard crane	16 man-hours
1 hand pallet mover	33 man-minutes

* These data are based on construction projects

4. MATERIALS MOVEMENT

The cost of moving maintenance materials can run as high as 30¢ of the maintenance dollar. That's why it's viewed as a fertile field for cost reduction.

Think of materials as three kinds: maintenance materials and supplies, maintenance tools and equipment, equipment being maintained. Assuming you must regularly move any one of these types, you now are faced with this question: Which way will cost the least? To answer, first scan the types of materials-handling equipment available (page 96), then pick out the desirable equipment and various alternates.

Your choice looks expensive, does it? Scares you off? Well, here's encouraging news: Look at the tabulation above. It represents the experience of Du Pont's Construction Division of the Engineering Department in justifying materials-handling equipment for construction projects. It shows the time each piece of equipment listed must save in construction man-hours to justify its purchase. For example, to justify a fork-lift truck for yard-type duty on a construction project requires a savings of only 12 man-hours per week. This is the right way to consider purchase of materials-handling aids—by the savings involved.

We have no direct correlation between these decisive guides for construction work and those that could be applied to maintenance. Generally, hold-ups in maintenance jobs involve fewer penalties, fewer people. Hence the savings in job-time are not so rich.

But even if we assumed arbitrary savings of one-fourth the construction values—to be on the very safe side—it's apparent there are many justifiable maintenance applications that are not now in wide use. For example, a fork-lift truck would have to save not much more than one man-week to justify itself in maintenance operations.

There has been wide use of the farm-type trailer fifth-wheel steer design with 3x6- or 4x8-ft. platforms in Du Pont construction. The reason is obvious—it needs only 15 man-minutes savings a week to justify it. Projecting this into maintenance operations on the basis of a factor of four, a saving of only one man-hour will pay for it. Similarly a saving of 16 man-hours will pay for a tractor, and a saving of less than 2 man-weeks will pay for a yard crane.

These figures are cited specifically to stimulate more thinking about the wider use of mechanical handling equipment for moving maintenance materials. They are not to be taken as absolute values. You can work up justification for any single application, as already shown (page 97). By the same token, if you know the cost facts about any specific equipment, you can reverse the calculation to arrive at a dollar figure of savings (table above)—and hence man-hours—needed to justify its purchase.

5. DOING THE JOB

Now that you have figured the cheapest way to move materials to the job site, don't stop there. The same principles apply to purchase of equipment for better performance of the maintenance job.

For example, one plant had to sling a chain fall from overhead steel every time one of several two-stage compressors needed major servicing. An analysis of job cost showed that the installation of a permanent bridge crane over the compressor area would be justified purely on a labor-savings basis.

The tip-off in this case, mind you, was repetition of only a minor part of the job. But it did involve materials handling. Acting on similar clues that were there for the finding, Du Pont has purchased various kinds of fixed equipment such as hoists, cranes, and monorails. It also has purchased mobile equipment such as hand trucks and buggies and carts, work benches, powered tools, welding machines, lubrication equipment, automotive trucks, and scaffold wagons.

6. COMMUNICATION

What has this to do with materials handling? The fact is, communications engineering to date has been sadly neglected in coordinating maintenance and materials handling in industrial plants.

Good communications can save many non-productive movements of men and materials. Here are common examples: public address systems in storerooms or open storage areas, Telautograph telescriber or facsimile equipment to transmit messages or sketches from engineering to maintenance or storeroom areas, and even closed-circuit TV.

Radio dispatching of maintenance men and mobile handling equipment is a big travel timesaver. The cost is usually only a fraction of the savings through better utilization of manpower and equipment. A maintenance fork-lift truck under two-way radio control, for example, can handle many odd jobs sandwiched between planned ones.

Newest aid to higher manpower productivity is the pocket-sized transistorized receiver—and lately the portable transmitter. These two devices dramatize their value best in breakdowns or changes of plan. But

25 Tips to Better Maintenance Handling

1. Use special tool carts, portable work and test benches, or lubrication carts wherever possible for maintenance workers.

2. Use fork-lift trucks to fetch and move heavy equipment or machinery into place.

3. Use overhead portable platforms or scaffolds to cut time of installation, repair, or servicing.

4. Install permanent ship ladders and overhead platforms to cut make-ready and put-away time of job. Try built-in mechanical manlifts where frequent trips to high levels are necessary.

5. Consider permanent handling helps, such as overhead beams or hooks, or ground-level slide-rail mounts, to cut job time of regular inspections or overhauls of heavy equipment.

6. Try weatherproof covering to store materials directly on job site, rather than in storeroom.

7. If you can't store incoming materials at job site, consider unloading them onto trailers to avoid reloading.

8. Order materials in pallet loads when you can—cement, brick, concrete block, and tile. Schedule their delivery right to the scaffold.

9. Check all new machinery, such as large motors and transformers for lugs or eyebolts that will make lifting easy.

10. Use 3-dimensional models to check rigging and installation moves of large equipment from unloading point to destination. Check clearances for later maintenance handling operations.

11. Mount maintenance or service equipment (air compressors, welders, etc.) on easy-to-move wheels.

12. Bring tools to a job requiring cut-and-try fits, instead of making repeated hikes to shop. Powered pipe-cutting tools, for example.

13. Arrange your present storage space for better use of transportable materials-handling equipment, such as stacking boxes or stacking racks and pallet racks.

14. Attach casters to accessory equipment (small shop drills, sheet-metal brakes or shears) for easy movement around shop or to job.

15. Use trailers for long hauls (say over 500 feet) instead of tying up fork-lift trucks. Consider dual sets of trailers—one to load while other is enroute.

16. Keep outside storage areas well lighted, reasonably level, and properly surfaced and drained for comfortable and safe access.

17. Consider portable wheeled supply bins from storeroom to job site. Or stacking or drawer-type storeroom bins placed on a trailer.

18. Think about chutes or gravity skate-wheel or roller conveyors to save steps where piecemeal transfer of many items must be made in storeroom or on the job. Or overhead monorails or trolley hoists to help on heavier items.

19. Try a powered belt or flight conveyor to speed delivery to another floor level.

20. Consider supermarket-type carts or shelf-trucks in storeroom to cut time in order-picking or hauling of spare parts or supplies.

21. Try "spacers" on piles of lumber or pipe materials to facilitate mechanical handling.

22. Use special fork-lift attachment (a ram, boom, or clamp) to cut handling time of containers, barrels, boxes, pipes, coils, bales.

23. Consider multiple forks or a side-shifter for precise positioning of load.

24. Use a walkie-type power truck so one man can deliver a load where two are now necessary.

25. Try lightweight crawler or roller-type skids to move or tow heavy machinery or equipment.

there's a good field for integrating such equipment into regular maintenance scheduling activities. Crews can be shifted directly from one job site to another, and supervisors can arrange for tools, parts, and even transportation. Maintenance men can reach their supervisors for immediate instructions without having to hustle to the job. Such facilities become like a telephone. Once you use them you wonder how you ever did without them.

FINDING EASY CUTS

We've spelled out the four-fold objective in moving materials: getting the right material to the right place in the right quantity at the right time. And laid down the six basic rules for doing this the cheapest way. Finally, here's the keystone rule of them all: Don't move anything before you plan it.

What's the best place to start the economy drive? Anywhere. But the results are likely to be more profitable where repetitive or intermediate handling takes place. Yet there are many isolated but similar handling moves that, when added up, will justify equipment such as a fork-lift truck or a portable flight conveyor.

To illustrate the scope of possibilities and stimulate a broad approach, we have listed 25 ways in which you can improve your handling of maintenance materials (see panel above).

A study of these possibilities—and you should be able to add many more—suggests the wide area of manpower waste that exists in maintenance-handling operations. True, the solution is more often than not the use of machine power. This calls for capital investment. But consistently in the broad picture of industrialization our economic gains have depended on the substitution of machine power for manpower. This holds equally true in the virgin field of materials handling in maintenance operations.

Worker effectiveness will improve when maintenance men no longer have to serve as messengers or pack-mules. And maintenance men will practice more of their skills when they can quit the many load-lugging activities that often take up to a quarter of their time.

PAY RATES FOR KEY INDIRECT JOBS - IN 7 CITIES

• All figures are average straight-time earnings in manufacturing industries except figures with asterisk, which are for *all* industries. They include incentive pay, if any, but *not* overtime, weekend, holiday, or night-shift premium.

Weekly earnings are average salaries for standard work week.

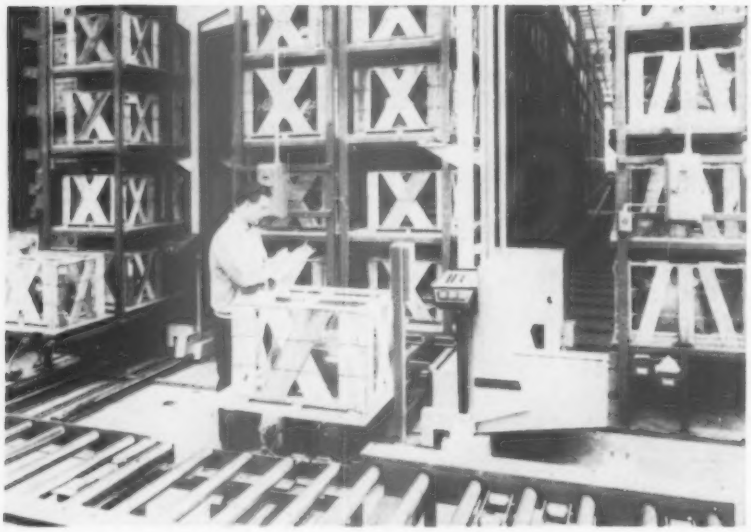
	MALE JOBS, EXCEPT WHERE OTHERWISE SHOWN	AVERAGE STRAIGHT-TIME HOURLY EARNINGS						
		BALTIMORE AUGUST 1958	BOSTON OCTOBER 1958	BUFFALO SEPTEMBER 1958	DALLAS OCTOBER 1958	DENVER DECEMBER 1958	ST. LOUIS OCTOBER 1958	SEATTLE AUGUST 1958
Maintenance and Powerplant Jobs	Carpenters, maintenance	$2.58	$2.42	$2.72	$2.36	$2.64	$2.74	$2.57
	Electricians, maintenance	2.66	2.62	2.87	2.42	2.67	2.89	2.73
	Engineers, stationary	2.46	2.61	2.64	2.26	2.66	2.84	2.56
	Firemen, stationary boiler	2.15	2.19	2.34	–	2.25	2.52	2.28
	Helpers, trades, maintenance	2.16	2.02	2.40	1.76	1.91	2.44	2.18
	Machinists, maintenance	2.91	2.60	2.82	2.47	2.62	2.93	2.78
	Mechanics, automotive, maintenance	2.29	2.42	2.62	2.05	2.63	2.66	2.57
	Mechanics, maintenance	2.69	2.30	2.77	2.30	2.58	2.64	2.72
	Millwrights	2.61	2.44	2.77	–	–	2.86	2.61
	Oilers	2.15	1.97	2.40	1.98	2.14	2.42	2.25
	Painters, maintenance	2.40	2.39	2.60	2.30	2.69	2.70	2.63
	Pipefitters, maintenance	2.60	2.55	2.69	–	2.71	2.84	2.61
	Sheetmetal workers, maintenance	2.81	2.56	2.77	–	–	2.88	–
	Tool and die makers	2.95	2.75	2.98	2.72	2.79	3.03	3.03
Custodial and Material Movement Jobs	Guards	2.17	1.95	2.32	2.02	2.23	2.19	2.12
	Janitors, porters, and cleaners	1.78	1.76	2.04	1.50	1.81	1.81	1.92
	Janitors, porters, and cleaners (women)	1.32	1.53	1.75	1.29	1.68	1.56	1.66*
	Laborers, materials handling	1.88	1.79	2.13	1.52	1.99	1.97	2.11
	Order fillers	1.57	1.90	2.17	1.81	1.98	2.03	2.16
	Packers, shipping	1.85	1.68	2.22	1.53	1.74	1.96	2.12
	Packers, shipping (women)	1.21	1.48	1.90	–	1.51	1.62	1.90
	Shipping clerks	2.22	2.10	2.38	2.00	2.05	2.26	2.34
	Shipping and receiving clerks	1.92	2.08	2.28	1.93	1.97	2.15	2.27
	Truck drivers:							
	light (under 1½ tons)	2.26	2.11	2.25	1.56	1.91	2.34	2.30*
	medium (1½ to and including 4 tons)	2.03	2.23	2.25	1.76	2.20	2.63	2.49
	Truckers, power (forklift)	2.32	2.03	2.30	1.79	2.05	2.18	2.18
	Truckers, power (other than forklift)	2.31	2.03	2.30	2.22	–	2.09	2.20
	Watchmen	1.47	1.68	1.82	1.38	1.56	1.84	1.89
	FEMALE JOBS, EXCEPT WHERE OTHERWISE SHOWN	**AVERAGE STRAIGHT-TIME WEEKLY EARNINGS**						
Office, Professional, and Technical Jobs	Comptometer operators	70.50	61.00	71.00	70.00	69.50	68.50	73.50
	Draftsmen, senior (men)	115.00	111.50	120.00	93.00	104.50	116.00	97.50
	Draftsmen, junior (men)	82.00	86.50	87.00	73.00	80.00	86.50	78.50
	Duplicating-machine operators	61.50*	55.50	61.00*	59.50*	65.00*	59.50	58.50*
	Key-punch operators	69.00	62.50	73.00	68.50	70.50	64.50	72.50
	Nurses, industrial (registered)	91.50	81.50	93.00	85.00	82.50*	85.00	96.00
	Office girls	48.00*	54.50	56.50	58.50	49.50*	52.50	64.00
	Payroll clerks	68.00	65.00	73.00	68.00	72.50	65.00	78.50
	Secretaries	85.00	78.00	85.00	81.50	85.00	84.50	90.00
	Stenographers, general	76.00	68.00	77.00	75.50	72.50	68.50	76.50
	Typists, Class A	73.00	61.00	75.50	64.00	67.50	68.00	73.00
	Typists, Class B	63.50	58.00	64.00	60.50	57.50	60.00	63.00

Indirect Wages: They're Still Soaring

UP AND UP goes the indirect-wage spiral, according to FACTORY's latest exclusive report from the Bureau of Labor Statistics, U. S. Department of Labor. Take the very first figure (table above). In August 1958 carpenters in Baltimore were paid $2.58 per hour. That was 18¢ higher than in August 1957. To check trends in your own area, see previous BLS studies reported exclusively in FACTORY in June and September 1958, May and August 1957, May and August 1956, May and September 1955.

FACTORY EQUIPMENT NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.



Electric Carriers Speed Handling

Here's a one-man-operated storage and handling system that moves loads up to 3500 lb. from 4800 compartments at average rate of one-a-minute. Occupies only 5005 sq. ft. of floor space, one-half the area used by conventional storage methods.

System consists of 20-ft.-high racks (8 tiers) along four 150-ft. long, 42-in. wide aisles. A track-mounted, electrically controlled carrier works both sides of aisles. To load or unload, operator selects compartment, pushes key. Carrier moves from starting position beside roller conveyors to proper tier, then rises vertically until it reaches compartment. Conveyors at end of aisles transport loads to or from carriers to central loading point. If operator tries to load filled compartment, carrier automatically rejects order, returns to starting position. It accepts loads on skids or pallets, in pans or boxes. *Triax Equipment* (Circle 101).

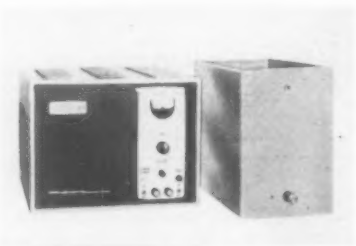
102—Emergency Suit protects man up to 6-ft. 4-in. tall, weighing up to 250 lb., from toxic vapors and fumes. For any type of self-contained breathing apparatus. Slide fastener extends from left knee, over left shoulder, and around head. *Union Industrial Equipment Corp.*

103—Safety Hats and Caps, of glass fiber, aluminum and plastic, feature polyethylene suspension which is easily removed with snap-in "t-slots." Lock-straps assure minimum 1¼-in. clearance between crown and shell. Sweatband is replaced quickly. *Apex Safety Products.*

104—Bird Repellent Light, by rotating in circle and flashing colored beam 200 times a minute, disturbs nesting habits. Reduces costly bird damage to warehouses, granaries, storage areas, hangars. Low-cost unit is 9½ in. in diameter, works on 115/120 v. *Trippe Mfg. Co.*

105—Light "Thermostat" measures daylight and adds right amount of artificial light to keep foot-candles constant at any pre-set level. Consists of dial for pre-setting light level, photoelectric scanner to monitor intensity, and signal station. *Superior Electric Co.*

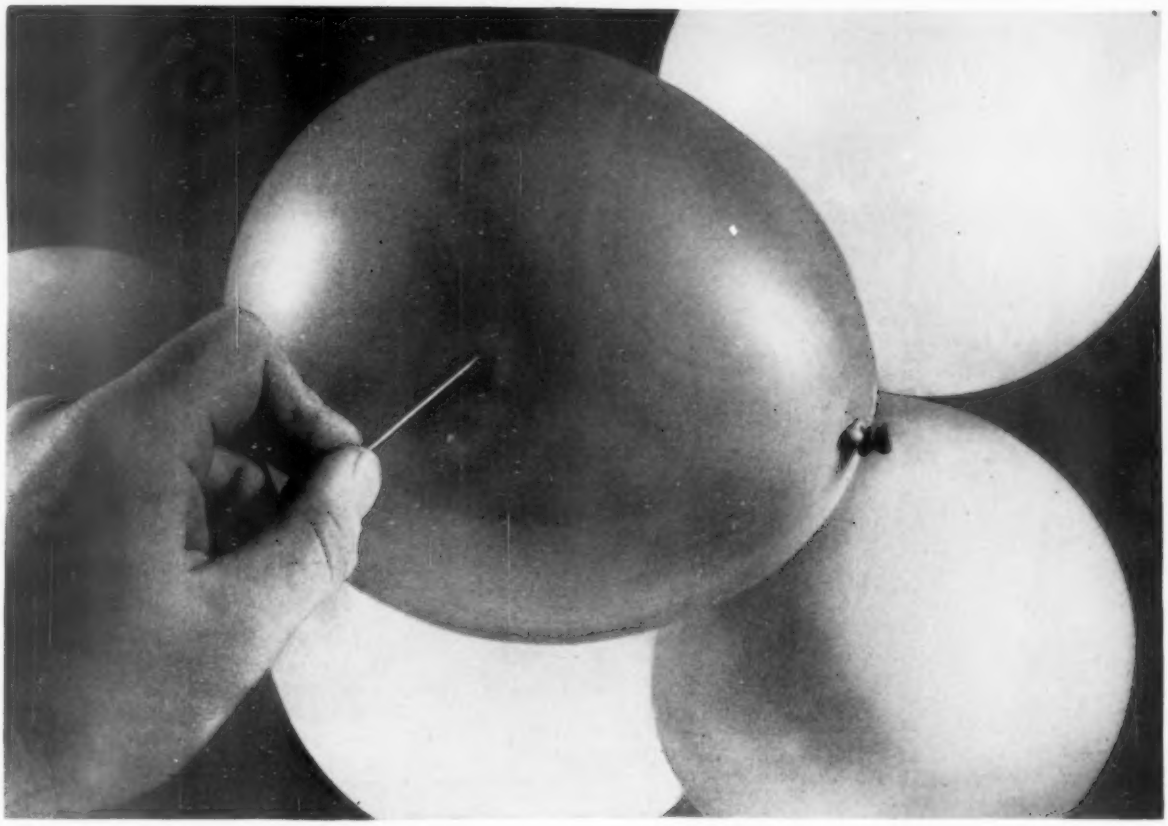
106—Hand Embosser makes labels "on the spot" from plastic or metal tapes. Raised letters on plastic tape change color for greater legibility. Labels have pressure-sensitive backing. "Dymo-Mite" has built-in cut-off blade, calibrated tape position indicator. *Dymo Corp.*



107—Ultrasonic Cleaner for gears, bearings, and instruments removes excess solder flux, fingerprints, lint waxes, grease, etc. Consists of generator and matching transducerized tank with output from 60 to 1000 watts, capacities from 1 to 20 gal. *Circo Ultrasonic Corp.*

108—Automatic Laminator encases paper, card, board, or cover stock in clear, tough film in 3 sec. Provides waterproof, tamperproof protection in lifetime seal. No larger than a typewriter, it handles material 17 in. wide; holds 2000-ft. film roll. *General Binding Corp.*

Turn the page



Machine Tool Buyers:

Beware the fallacy of projecting today's labor rates!

Almost without exception, machine tool replacement formulas employ an erroneous factor in computing savings — they are based on *today's* labor rates.

It seems basically sound to suggest, in the case of a contemplated investment in equipment, that a projection be made as to the estimated period over which the equipment is to be used.

Assuming this to be ten years, it is a fairly simple matter to project the *average* wage rate over the next ten years by using the historical increase for the past several years. This increase is known to be from 5 to 6% per year.

Using 5%, we then have a simple computation to determine the average projected wage rate which should be used in computing savings in a replacement formula.

Assuming a current wage rate of $2.50 per hour, this becomes $4.07 per hour at the end of ten years, or an increase of 62.8% over today's labor rate.

This percentage increase could reasonably be applied also to other factors in the computation of savings, such as indirect labor, fringe benefits, maintenance, etc.

In contemplating the purchase of a piece of equipment which will last for a number of years, it is fallacious, therefore, to compute savings in terms of today's costs only.

Does Jones & Lamson offer a positive approach; a realistic, workable formula that is free from fallacies such as this? *Yes!*

Write today for complete information.

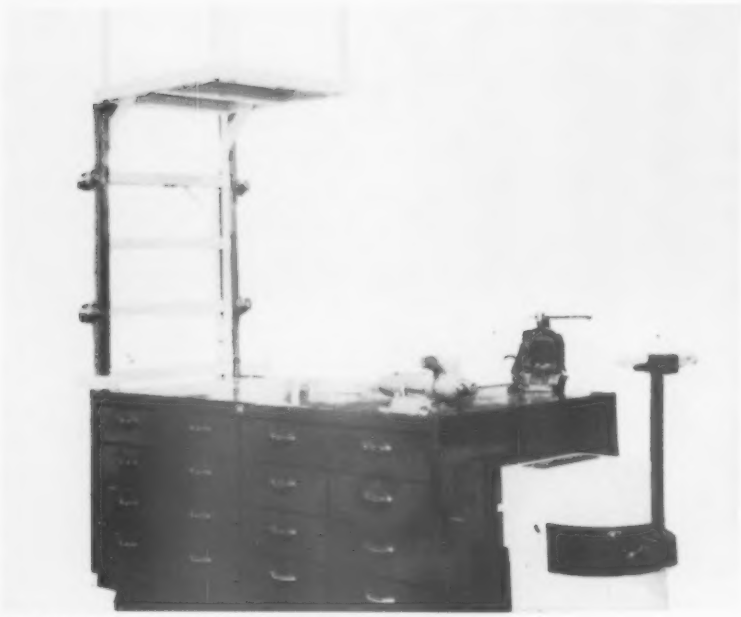
the man who needs
a new machine tool
is already paying for it

JONES & LAMSON Machine Company, 505 Clinton St., Springfield, Vt.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

For more facts Circle 493 on Reader Service Card

For more about these items, circle numbers on Reader Service Card next to back cover.



NO NEED TO RETURN TO SUPPLY CENTER WITH . . .

Fully Equipped Mobile Workshop

If walking to and from the supply center in your plant wastes too much time, here's a built-in answer to your maintenance, repair, and overhead assembly problems. It's a battery-powered shop-on-wheels complete with telescope work-platform, bench vise, pipe vise, and large cabinet. This low-priced unit transports 2000 lb. of tools, materials, and equipment to any trouble spot.

Heavily constructed of unitized, welded steel, one side of the cabinet section contains 16 drawers each with inner sliding tool tray. Two sliding-door shelf compartments make up the other side. The 34x68-ft. table top can be fitted with drill presses, bench grinders, and other power tools.

The "Shop-Van" has five wheels equipped with either steel, hard plastic, or rubber tires. The fifth drives the van at a speed of 2½ mph. Highly maneuverable, unit can make a complete turn within its own diagonal length. *Vanguard Engineering Co.* (Circle 109).

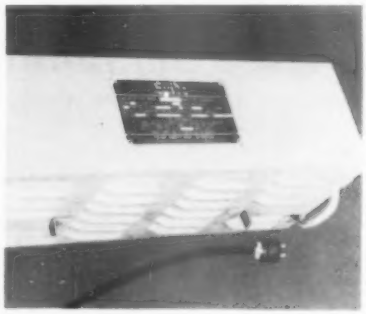
Hand Tools Install Power Steering Unit

Bumps, shocks, and driver fatigue are at a minimum with this easy-to-install 3-in.-diameter power steering unit. A few hours' work with ordinary hand tools installs it on gas-powered trucks. Driver has complete control of wheel at all times. There's no steering wheel kickback when truck stalls. Separate flow divider regulates hydraulic flow for full-time power steering and for other hydraulic accessories. *The Ready-Power Co.* (Circle 110).

111—Accumulator Attachment for lift trucks absorbs shocks, vibrations, jars, and jolts while vehicle maneuvers over rough ground, fully loaded. Can be installed on main hydraulic cylinder in less than an hour. Easy on driver, cuts repairs and downtime. *Special Products Co.*

112—"Thinline" Motor is 55% shorter and 26 lb. lighter than standard NEMA-type "D" flange motor of same rating. Gives more hp. in less space for machine tools, fans, blowers. Horizontal or vertical mounting, rated from 1 to 5 hp. at 1800 rpm. *General Electric Co.*

113—"Vibraflex" Pipe, made of flexible rubber, eliminates 90% of water line noise and vibration. "Vibrates" at a frequency over 500 times lower than steel pipe. Two models: 150- and 250-psi. capacities, with 2- to 14-in. ID, 24- to 60-in. lengths. *Mercer Rubber Co.*



114—Battery-Charger, containing transistorized control unit, rides around with battery. Charges it while in truck by plugging into 115-v. a-c wall outlet. Automatically maintains correct charge rate. Saves space, labor, and downtime. *The Electric Storage Battery Co.*

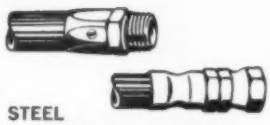
115—Wall Chart, for scheduling, charting, or planning, permits writing with black or colored marking pencils. Wipes off with paper towel or cloth. Mounts on wall, floor stand or table-top easel. Kit includes stick-ons of alphabet, numerals, blanks. *L. D. Blehart Co.*

Turn the page

STANDARD HOSES

LOW PRESSURE	H-9 SAE 30R2	H-100 COTTON COVERED
MEDIUM PRESSURE	H-17 SAE 100R3	
HIGH PRESSURE	H-25 SAE 100R2	
MEDIUM HIGH PRESSURE	H-69 SAE 100R5	
MEDIUM HIGH PRESSURE	H-108 SAE 100R1	
HIGH PRESSURE	H-35 H-50 Spiral Wire Reinforced	

REUSABLE ENDS



STEEL

STANDARD 2-PC. END

For fast assembly and positive, leakproof connections. Designed for dependable performance under high pressure. Skive and no-skive.

CLAMP-TYPE

For most two-wire braid high-pressure hydraulic hose applications. No skiving of hose or special tools required.

BARB-TITE ENDS

Fast, easy push-on, stay-on hose ends for all types of low pressure applications. Sizes ¼" to ¾" I.D. Rugged and durable.

HOSE ASSEMBLIES

PERMANENTLY ATTACHED HOSE ENDS

Swaged or crimped permanently attached hose ends. Any quantity, any size, any type. ¼" to 2". For all working pressures.

CRIMPED

SWAGED

TUBE-HOSE ASSEMBLIES

THE WEATHERHEAD COMPANY

FORT WAYNE DIVISION • Dept. FA-6, 128 West Washington Blvd.
Fort Wayne, Indiana

For more facts Circle 494 on Reader Service Card

116—Wall Panel, of steel or aluminum, comes in 3-ft. widths, 32-ft. lengths. Permits quick, low-cost building construction in contrast to other materials using shorter, narrower panels. Corrugated shape gives pleasing shadow lines, strength, rigidity. *Butler Mfg. Co.*

117—Multiple V-Belts, using fewer belts, smaller and lighter sheaves, and shorter center distances than conventional types, transmit more hp. at less cost. Compact "DA 358" has more sidewall area, a domed top for greater compression, fewer cross-sections. *Durkee-Atwood Co.*

118—Air Hoists, lightweight and portable, can be installed by one man. Save time and operating costs, remove pressure from busy shop crane. Two models: 1000 and 2000 lb. lifting at 45 and 22 fpm. Brake automatically when controls release. *Ingersoll-Rand Co.*

119—Shock Absorber Door has resilient, Urethane-filled bumpers that withstand continual pounding by heavy fork trucks. No damage or costly "time-outs" for repairs. Easy-to-install, self-closing door has neoprene seals at periphery to cut out drafts, noises. *Clark Door Co.*

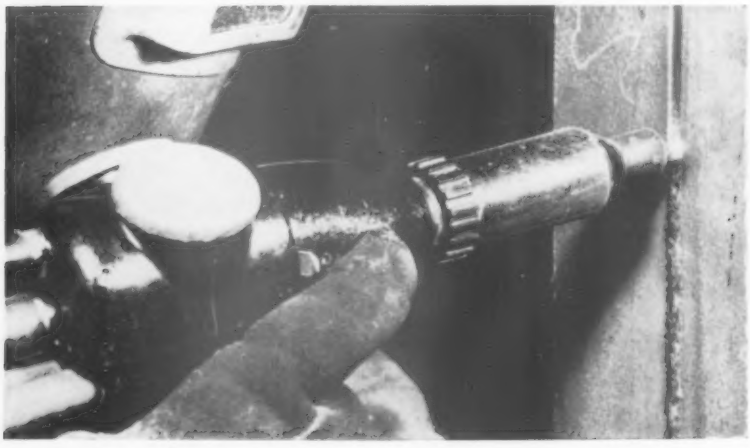
120—Cooling Towers save 95% of water volume with water-cooled air-conditioning systems or equipment requiring process water. Come in 5- to 60-ton capacities. Model 3208 with 7½-ton capacity at 78 F. wet-bulb temperature, measures 30x54x54. *Mason Products, Inc.*

121—A-C Motor with square look reduces mounting space from 22 to 45% over old-type rounded motor. Pre-wound core assemblies and parts standardization in ratings to 500 hp. make possible deliveries in 3 to 4 weeks. Waterproof construction available. *General Electric Co.*

122—Side-Brake Mechanism for medium-duty casters has foot lever on outside of caster. This actuates formed brake shoe which drops over vertical axis of caster, covering maximum area of tire tread. Fits 4- to 6-in. diameter, rigid or replaceable wheel casters. *Jarvis & Jarvis, Inc.*

123—Ground Detector and fault-finder quickly locates accidental grounds on a-c and d-c power systems, up to 600 v., without closing down power supply. "Brunt Fault-finder" has foam-rubber covered double earphones as standard equipment. Weighs 18 lb. *Parr Mfg. Corp.*

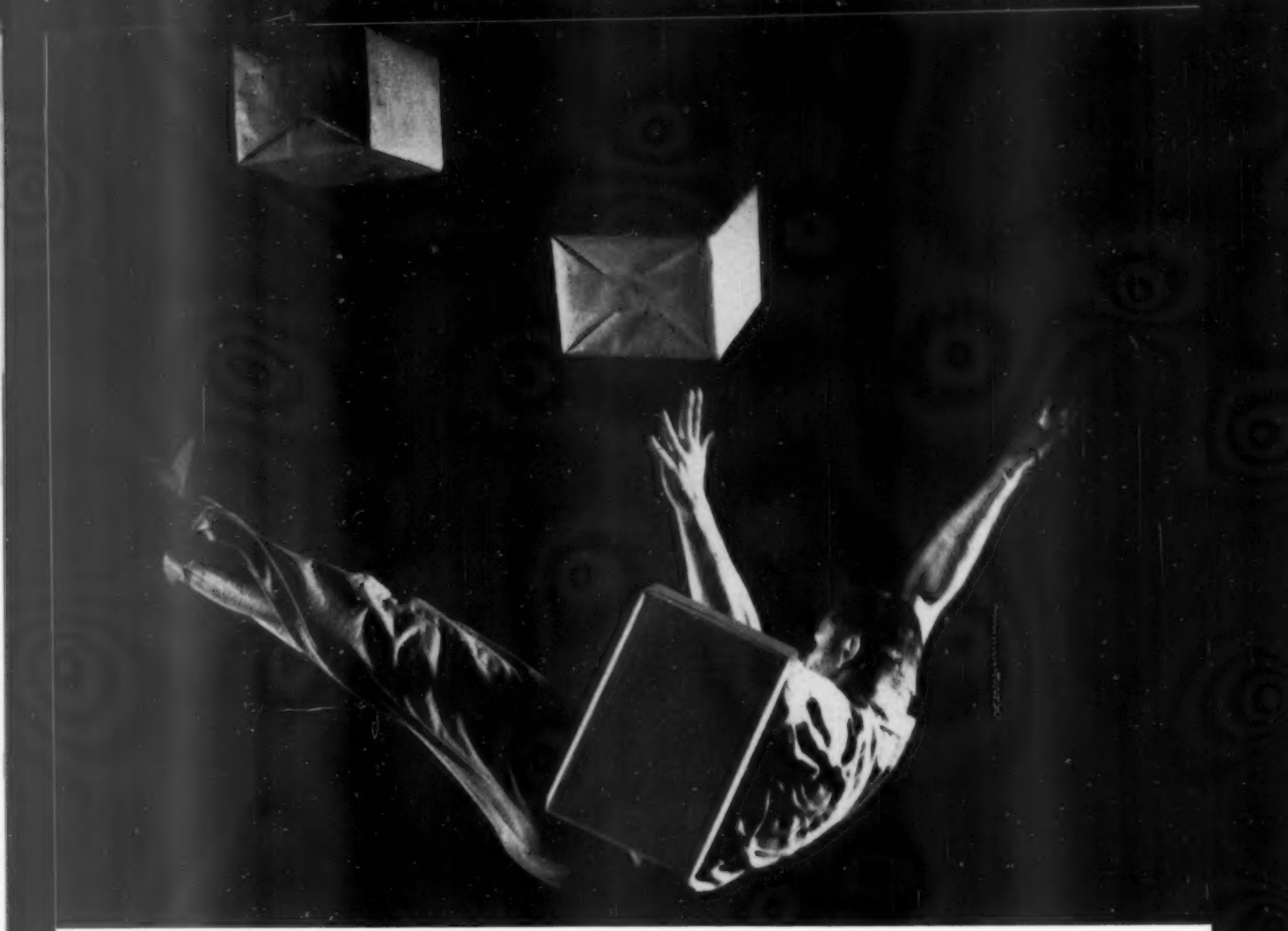
124—Fluorescent Lamp, 40 watts, is said to give 11 to 17% more light than other 40-watt lamps. Rated at 3100 lumens, it delivers 77½ lumens per watt. On Rapid Start circuits life is 7500 hr.; on Preheat ballasts with FS starters, it's 5000 hr. *General Electric Co.*



Vertical CO_2 Welding

Semi-automatic vertical welding of thin sections with little spatter and runout is now possible with low-cost "Dip Transfer." With it, CO_2 is used alone, or in combination with argon, to weld mild and low alloy steel with a pulsing rather than an open, stable arc. Works best at current levels below 200 amp. with wires less than 0.045 in. Welding sheet ¼-in. or less is well suited to process. Uses Aircomatic welding gun and control equipment. *Air Reduction Co.* (Circle 125).

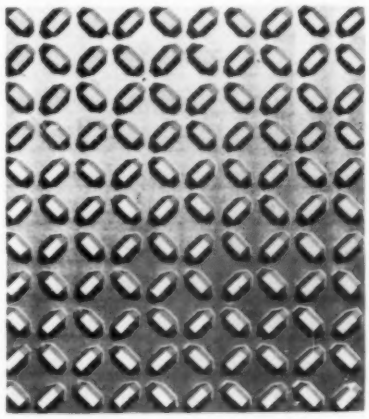
Turn the page



One slip can cost more than USS Multigrip

$100,000 for a single fall? Sounds fantastic, doesn't it? But there are actual cases involving suits for $100,000 or more for single falls. The average cost of injuries from slips and falls is lower than that, of course. In six states, during 1954, the cost per fall averaged close to $900.

You can eliminate many slips and falls by giving your workers a floor studded with cleats—USS Multigrip. This floor plate provides safe traction in any direction. The cleats are flat on top, easy to walk on—and do not catch the shoe.



For machine shops, loading platforms, cat-walks, and other dangerous locations, Multigrip supplies safety plus.

Where floors take a heavy beating from traffic, Multigrip will stand up for years under constant use. Oil and water won't soak in and can be easily removed from the surface with regular cleaning materials. You save money by having a floor that is easy to sweep or flush clean—and there's little or no maintenance.

On your next inspection trip, search out the danger spots—and make them safe with USS Multigrip.

USS is a registered trademark

Sold by leading distributors from coast to coast.

United States Steel Corporation – Pittsburgh
Tennessee Coal & Iron – Fairfield, Alabama
Columbia-Geneva Steel – San Francisco
United States Steel Supply – Steel Service Centers
United States Steel Export Company

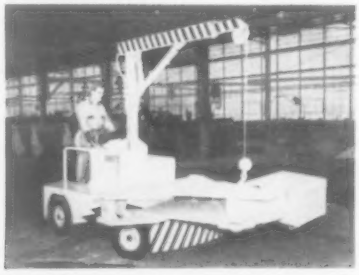
United States Steel

126—"Detectascope" locates deep subsurface cracks, laps, voids, also grinding, welding, and heat-treating cracks on painted or plated surfaces. No damage to part or danger to operator. Works electromagnetically; plugs into 110 v. outlet. *Ferro Machine & Tool Corp.*

127—Turntable, for permanent or temporary installations, can be assembled by two men in less than ½ hr. with just 12 bolts. Has 3-ton load-carrying capacity. Low-cost unit comes in sizes from 4 to 16 ft., with speeds adjustable from ½ to 5 rpm. *Anchor Steel & Conveyor Co.*

128—"Electromite" Floor Truck has power mechanism built into one of two rigid casters on vehicle. Operated by one man, vehicle carries loads up to 1600 lb. on level or 10% grade. Fingertip controls; dynamic brakes; forward and reverse with speeds to 4 mph. *Dynex, Inc.*

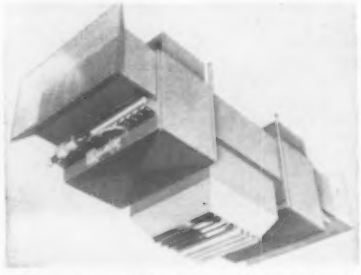
129—Gas Detector determines, with ±5% accuracy at 68 F., concentration of toxic gases and vapors. Kit includes hand pump and 20 detector tubes. In 36 gas-sensitive types, tubes contain chemical reagent which reacts to gas. Needs no skill. *Union Industrial Equipment Corp.*



130—Tractor Crane handles odd-sized or shaped material in plant or outdoors. Has hydraulically controlled boom which rotates a full 360 deg., raises from horizontal to 75-deg. angle, extends to 8-ft. 6-in. "Go-Devil" is 102-in. long, 54-in. wide. *Drott Mfg. Corp.*

131—Bin Level Indicator, corrosion-proof, works with light, low-density materials or heavy, dense, coarse, and abrasive materials. Standard or explosion-proof models for wall-attachment or suspension. Automatically stops or starts flow in or out of bin. *Bin-Dicator Co.*

132—"Lo-Lift" Truck, in 4000- and 6000-lb. capacities, has single-frame construction and 6-in. hydraulic lift for high underclearance. Ideal for steep ramps; doesn't hang at ramp peak. Fingertip pushbutton controls with two forward and reverse speeds. *Barrett-Cravens Co.*



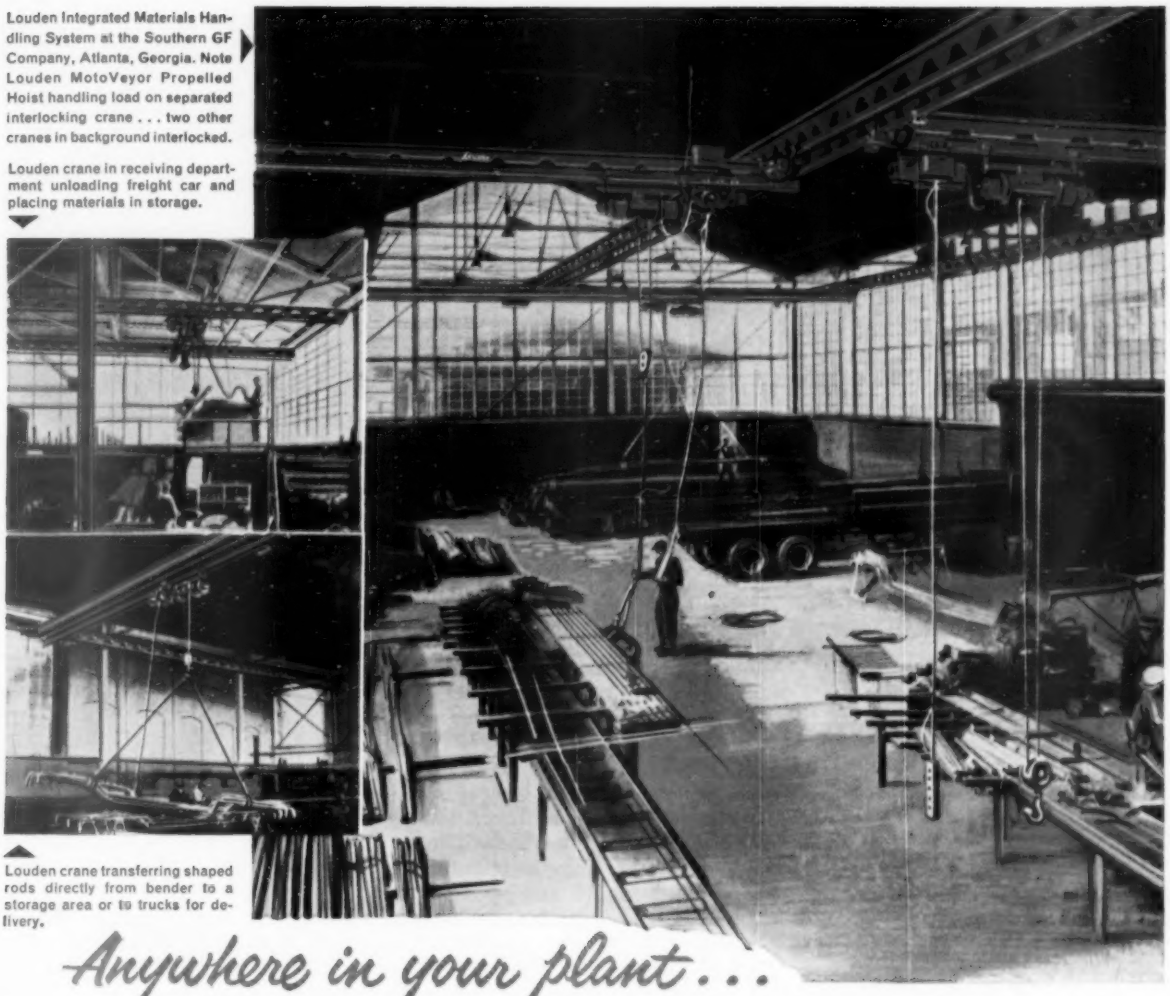
133—Gas Heater, direct-fired, pushes heat down and around obstructions from high ceilings up to 40 ft. above floor level. Available in four sizes from 300,000 to 600,000 Btuh. Adjustable louvers direct heat to specific areas for spot concentration. *Reznor Mfg. Co.*

134—Battery-Charger for switchgear tripping and control, requires little maintenance. When breaker is tripped, battery supplies current to operate pilot lights, holding coils, etc. When circuit closes, charger restores battery to full charge. *C & D Batteries, Inc.*

Turn the page

Louden Integrated Materials Handling System at the Southern GF Company, Atlanta, Georgia. Note Louden MotoVeyor Propelled Hoist handling load on separated interlocking crane . . . two other cranes in background interlocked.

Louden crane in receiving department unloading freight car and placing materials in storage.



Louden crane transferring shaped rods directly from bender to a storage area or to trucks for delivery.

Anywhere in your plant . . .

LOUDEN INTERLOCKING MONORAIL CRANES

Typical of how Louden Material Handling Systems can integrate the handling operations in an entire plant is the installation at the Southern GF Company of Atlanta, Georgia. This steel bar fabricator uses two sets of Louden Interlocking Cranes, each on parallel sets of Louden Crane Runways that run the length of the fabricating area. A single Louden Crane is used width-wise at one end of the plant for unloading and placing raw materials in storage. The interlocking cranes pick up material from storage and deliver it to the shears, then to the benders and from there either to storage or to trucks for immediate use.

"With this integrated system, handling has been made easier by transferring, not only from end to end, but also from side to side . . . and in addition, can load trucks direct from the benders. This system has enabled us to put to better use our entire floor space."

A Louden System combines *all* the essentials for satisfaction . . . *the engineering, the experience and the equipment capable of gaining full benefit from the fundamental advantages of overhead handling.* Call on a Louden engineering representative today to help you with your materials handling problem. Your inquiry will receive prompt attention.

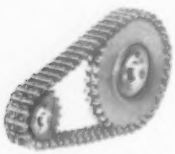
NEW . . . get the latest information on the best in modern materials handling methods. Full of how-to-do-it ideas . . . industry by industry. Write today for your copy of "COST-CUTTING WITH MONORAIL AND CRANES."

THE LOUDEN MACHINERY COMPANY
9506 Broadway, Fairfield, Iowa
A Subsidiary of Mechanical Handling Systems Inc.

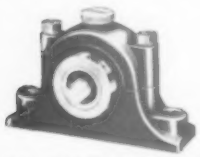
Louden
MONORAIL & CRANES

SINCE 1867 . . . THE FIRST NAME IN MATERIALS HANDLING

NEW! DYNA-V DRIVES
Save space, weight and cost!



TAPER-LOCK ROLLER CHAIN DRIVES
No reboring — no waiting!



DODGE PILLOW BLOCKS with TIMKEN BEARINGS
America's Quality Pillow Blocks!

•

Write for Bulletins!

- ✓ Dyna-V Drives — selection data.
- ✓ Chain and Sprockets — drive data.
- ✓ Rolling Bearings — ratings, data.

DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

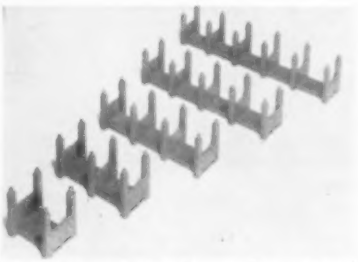
For more about these items, circle numbers on Reader Service Card next to back cover.

135—Battery-Powered Sweeper works for 8 hours on single charge. Combines two 1-hp. d-c motors (one for propelling, other for sweeping), with interbalanced brush-and-vacuum system. It's efficient even while traveling slowly in congested areas. *G. H. Tennant Co.*

136—Cable Support System is made of aluminum or steel mesh for more economy, efficiency, and flexibility in installing control and power cable. Reduces need for large supporting structures. Greater ventilation permits higher amp. ratings and results in less electrical loss. *Chalfant Products Co.*

137—Incline Conveyor moves about easily to transport materials from one machine to another or to tote boxes. In belt sizes from 6 to 24 in. wide, 4 to 12 ft. long. Fits into cramped spaces. Telescope legs adjust to any angle from 22 to 45 deg. *Bosworth Mfg. Co.*

138—Pneumatic Strapping Machine tensions, ties, and cuts round steel strapping for nearly any size package in one operation. Portable, it saves time and effort when strapping unwieldy packages. Works on 65-psi. air supply. Can be held or suspended. *U. S. Steel Corp.*



139—Storage Racks are for parts of various shapes such as rods, tubing, bar stock, castings, etc. "Mini-Module" comes in 1- to 5-section units. Common post construction for multiple units reduces width of each unit by 2 in. without cutting storage capacity. *Jarke Mfg. Co.*

140—Side-Loading Attachment, adaptable to any standard fork-lift truck, permits operator to pick up or discharge load without usual 90-deg. turn. Known as "Stow" system, it uses aisle only inches wider than load. Increases storage area by more than 50%. *Equipment Mfg. Co.*

Turn the page

Torque-Arm

THE DODGE DEVELOPMENT THAT CHANGED THE NATION'S HABITS OF SPEED REDUCTION

America's Most Complete Line of Shaft Mounted Speed Reducers

55 MODELS

- 1 to 200 hp. at 100 rpm!
- Output speeds from 10 to 378 rpm!
- Single Reduction
- Double Reduction
- 5 to 1 Ratio
- 15 to 1 Ratio
- 25 to 1 Ratio
- Any speed ratio up to 150 to 1 obtainable by selection of pre-determined combination of reducer and V-belt drive.

CALL THE TRANSMISSIONEER — your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

In fewer than ten years, the range of Torque-Arm Shaft Mounted Speed Reducers has increased from 6 to 55 models, to meet the ever increasing demand for this improved method of speed reduction.

By eliminating foundation, sliding base and flexible coupling this modern speed reducer has saved untold installation time and untold dollars of cost.

The rugged semisteel housing developed by Dodge has never been improved upon. It is corrosion resistant—and it has the strength to hold bearing seats in line for the life of the unit.

Dodge design provides wide spacing for the bearings. Loads are carried easily, contributing to Torque-Arm's long life and very high efficiency. The gears are finest quality—helical, heat treated steel.

Torque-Arm mounts vertically or horizontally in any position around the driven shaft. It locks to the shaft on *both* sides of the housing. The holes in the output hub provide simple removal with puller. Overload release and built-in backstop are optional.

Dodge Torque-Arm is America's most widely used shaft mounted speed reducer. It is stocked by your local Dodge Distributor. Ask him. Or write us for bulletin.

DODGE MANUFACTURING CORPORATION, 400 Union, Mishawaka, Ind.

DODGE
of Mishawaka, Ind.

For more facts Circle 497 on Reader Service Card

US RUBBER **ROYAL V-BELTS**

NOW SUPER SERVICE QUALITY

AT STANDARD V-BELT PRICES

The new, all-new U. S. Royal V-Belt, with 40% more H. P., is made like no other belt in the world.

This increased H. P., the result of a new exclusive method of building and new construction features, allows for reduction in the number of pulleys and belts required. The reduction, in turn, simplifies the problem of keeping belts in alignment and matchability.

U. S. Royal V-Belts are in stock at all "U. S." Transmission Distributors.

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When you think of rubber, think of your "U.S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

Mechanical Goods Division

US RUBBER **United States Rubber**

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

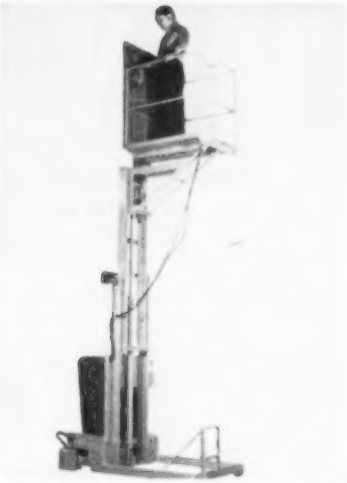
40% GREATER H.P.

In spite of these outstanding improvements and greater H. P., you pay no premium for the new U. S. Royal V-Belt!

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.



141—Maintenance-Stacking Unit has 30x36-in. platform that slips over standard fork. For overhead maintenance and transporting-stacking operations. Battery-operated, can be controlled from platform or ground level. Lift is 12 ft. 6-in. *Economy Engineering Co.*

142—Oil Interceptor is useful in machine shops, sheet and plate mills where oil separation is problem. Contaminated oil flows into interceptor where sediment is removed. Then it's pumped to a low-pressure tank for draining off into portable container. *Josam Mfg. Co.*

143—Thin-Wall Fittings and flanges of stainless steel are designed for nominal-temperature, low-pressure (up to 150 psi.), non-critical service. Low-cost line comes in ½- to 4-in. sizes. Swivel-type insert flange design (above) for easy alignment. *Chemetron Corp.*

Turn the page

ELIMINATE TRAMP IRON
in liquid pipelines

ERIEZ

permanent non-electric magnetic

FERROUS TRAPS

ULTIMATE PROTECTION against fine iron and tramp iron contamination for most liquid-handling pipelines. Ideal for installation in food, chemical and ceramic applications. Protect product purity. Increase production. Prevent abrasive wear; reduce damage to filters, mixers, pumps, etc. Made with strong, one-piece cast bodies, Ferrous Traps withstand pressures up to 150 psi. Provide greater magnetic area than all previous models. Effective with materials up to 750°F. Quickly pay for themselves. Two types: standard stainless steel models and highly polished sanitary models.

MAGNETIC STRENGTH IS GUARANTEED FOR LIFE • QUICKLY, EASILY INSTALLED IN ANY POSITION • CLEAN, SIMPLE DESIGN HAS NO MOVING PARTS • MAGNETIC ELEMENT LIFTS OUT IN SECONDS FOR INSPECTION OR CLEANING • ADAPTABLE FOR LINES FROM ½" to 4".

Free literature has complete installation and application information. Write today to:
Eriez Mfg. Co., 70-TB Magnet Dr., Erie, Pa.

ERIEZ

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

144—High-Speed Lift Truck is for outdoor use or in-and-out handling of palletized, unitized, or bulky materials. At full 4000-lb. capacity it lifts to 15 ft., has top speed of 18 mph. with a 42-hp. high-torque gas engine. Three mast sizes from 10½ to 21½ ft. *J. I. Case Co.*

145—"Air Mover" uses compressed air from shop line to remove smoke and fumes. Venturi unit is placed at opening of vessel or room enclosure where work, such as welding, is being done. Contaminated air is sucked out as fresh air enters through another opening. *Arcair Co.*

146—Step-Voltage D-C Tester for electrical equipment with 300-, 600-, and 2500-volt ratings. In bench and portable types. Ideal for field testing and preventive maintenance. Full-wave, dry-type rectifier promises long life. Output 5 ma. to 2½ kv. *James G. Biddle Co.*

Turn the page

ERIEZ

ALL NEW "Series 16" permanent PLATE MAGNETS are

16 WAYS BETTER!

Tests prove NEW "Series 16" magnets with greater magnetic strength stop tramp iron cold! New heavy duty aluminum cover increases rigidity, prevents pilferage and disassembly with subsequent loss of magnetic power. Choose from many models and strengths . . . optional face plates for abrasive, corrosive or sanitary uses; liquid or dust-tight applications. It's a fact: "Series 16" magnets, with 16 superior features, provide ultimate operating advantages at price of ordinary magnets!

GET 6-PAGE FACT-FILLED FOLDER. WRITE TO
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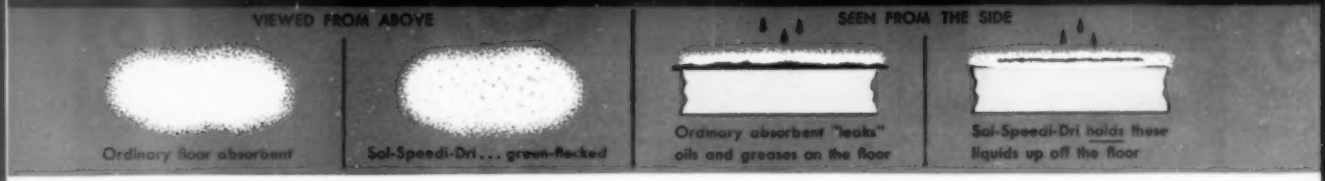
ERIEZ

Pull floor maintenance costs DOWN


VIEWED FROM ABOVE
SEEN FROM THE SIDE
Ordinary floor absorbent
Sol-Speedi-Dri . . . green-flecked
Ordinary absorbent "leaks" oils and greases on the floor
Sol-Speedi-Dri holds these liquids up off the floor

Do you know how much floor maintenance costs industry? As close as can be approximated, floor maintenance takes 16%* of the maintenance dollar—and all maintenance costs industry approximately 16 billion dollars annually. Let's be more specific—figure out how much floor maintenance costs your company:

Enter here your annual maintenance costs _____ **× 16%* =** _____ **This is the figure that can be reduced by using Sol-Speedi-Dri**

**Approx. % of maintenance spent on floor upkeep*

You can cut that sum by using a good floor absorbent—one that absorbs and holds all liquids off the floor surface. Sol-Speedi-Dri is a *good, safe* floor absorbent because it has *powerful holding* power. It extends floor life and saves costly repairs and resurfacing . . . and it makes floors more slip-proof by keeping its hard granular shape . . . it's the most dust-free absorbent made. This can be easily demonstrated.

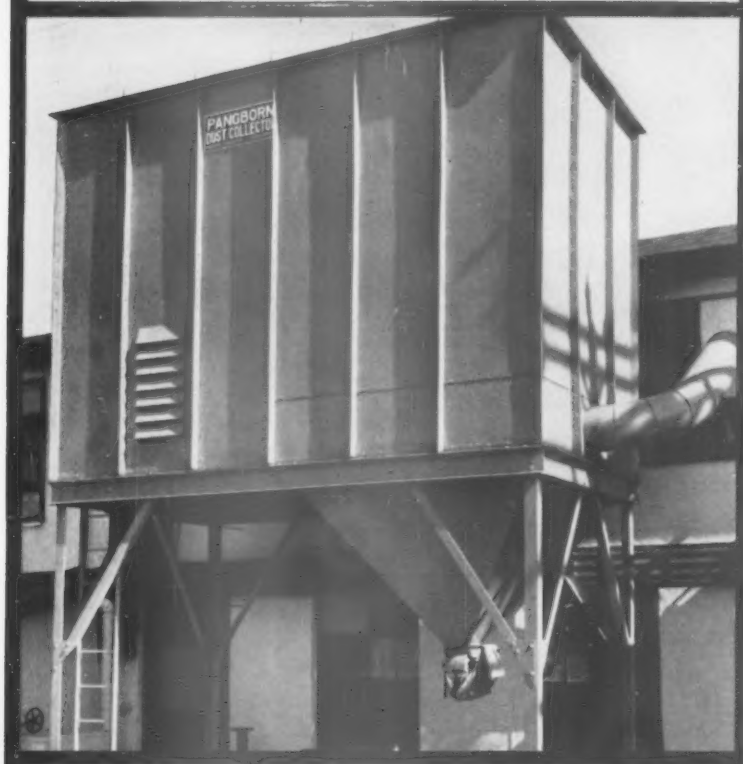
Look in the Yellow Pages under *Absorbents* or *Oil and Grease Absorbents* for your nearest Sol-Speedi-Dri distributor. Large, free sample of Sol-Speedi-Dri for the asking—no obligation.

USE A GOOD MINERAL FLOOR ABSORBENT

SOL-SPEEDI-DRI

SPEEDI-DRI DIVISION / MINERALS & CHEMICALS CORPORATION OF AMERICA, MENLO PARK, NEW JERSEY

TRAPS ALMOST 4 CU. FT. OF DUST PER WEEK



One small Pangborn Dust Control system replaces 8 collector units profitably at Precision Rubber Products

At Precision Rubber Products Corporation, Dayton, Ohio, millions of seals pass through a buffing process every year. The resulting dust could constitute an operating and housekeeping hazard. To facilitate dust control, the company replaced eight individual collector units with a central Pangborn Dust Control system. This installation saves floor space, operates quietly and gives efficient dust control (trapping almost 4 cu. ft. of rubber dust per week). Dust is now removed from *one* collector hopper instead of eight individual hoppers.

If dust is a problem in your plant, talk to the Pangborn man in your area or write PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control and Blast Cleaning Equipment—Rotoblast® Steel Shot and Grit.*

Pangborn CONTROLS DUST

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

147—Portable Welding Platform has 2000-lb. capacity, lifts to 66 in. Rolls to any part of plant for quick welding of containers and structural members. Casters lock to prevent movement while work is in progress. Motor: 220 v., 3 phase, 60 cycles. *Globe Hoist Co.*

148—Static Switching do-it-yourself unit to replace relays has built-in booster to offset reactance losses. Available for 120-volt a-c input, it supplies 120-volt a-c output at 15-, 75-, 150-, and 300-volt-amp. ratings. Five separate control windings. *Magnetics, Inc.*

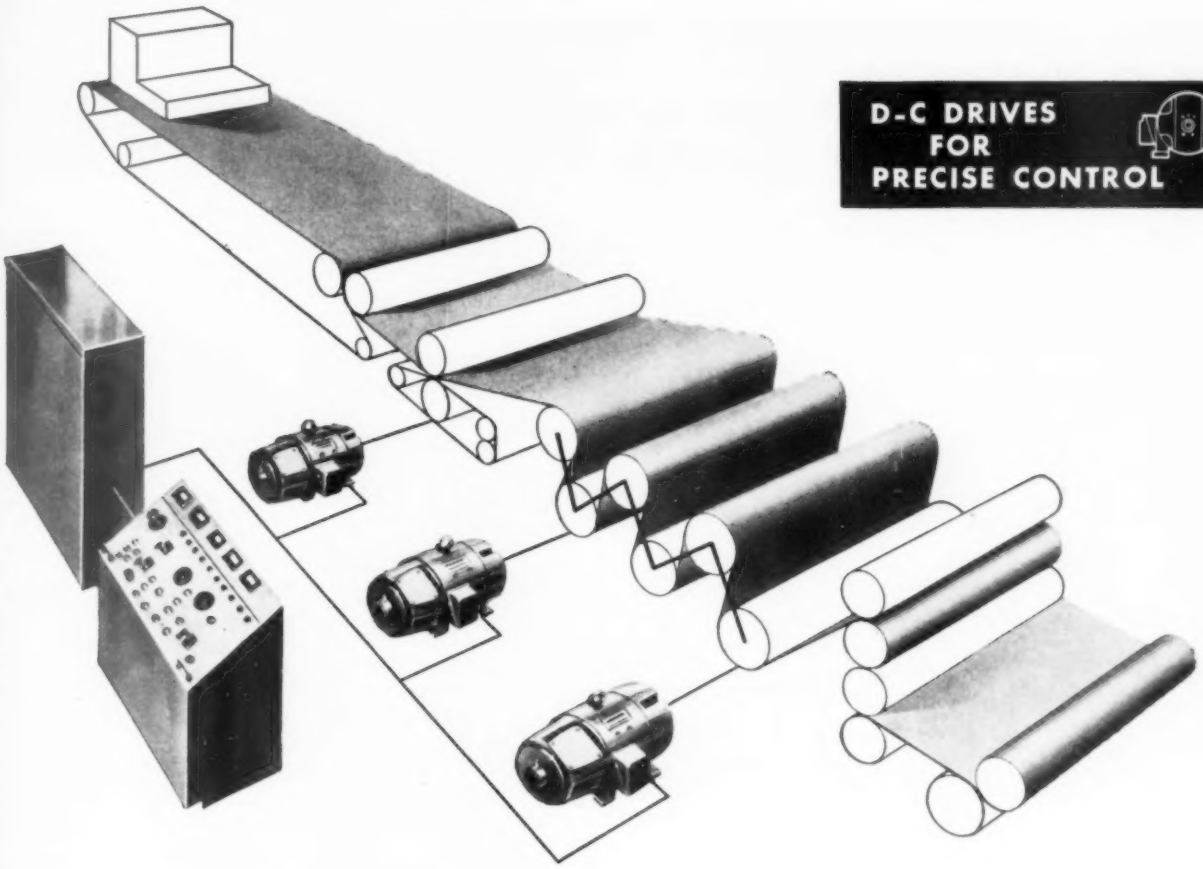
149—Narrow Aisle Truck, powered by 24-volt electrical system, permits 48x48-in. pallet load to be right-angle-stacked in aisles only 7-ft. 6-in. wide. Two drive motors are directly coupled to wheels. Four forward and four reverse speeds. Capacity: 4000 lb. *Raymond Corp.*

Turn the page

For more facts Circle 502 on Reader Service Card

For more facts Circle 503 on Reader Service Card ➤

D-C DRIVES FOR PRECISE CONTROL



Problem: How to coordinate two or more machines for greater production flexibility, lower costs

Operating at high speeds, working to close tolerances, meeting high-quality standards, today's machines must be controlled accurately. This is one of the reasons users and designers are making greater use of direct-current drives for coordinating two or more machines in multi-section process lines.

MACHINE COORDINATION IS A NATURAL JOB FOR DIRECT-CURRENT POWER. For direct current can best provide the accurate speed matching and extra measure of control needed for high-speed, automatic continuous processing.

D-c's flexibility allows each individual drive motor to be run at the exact speed demanded by the section of the process it drives. Increased output, better quality control and production flexibility lower the cost per unit of production.

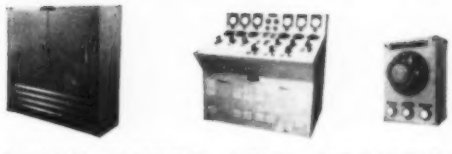
To learn more about the modern capabilities of direct-current power, write for your free copy of "WHY D-C?", *Section 829-3, General Electric Company, Schenectady 5, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

SELECT FROM GENERAL ELECTRIC'S COMPLETE LINE OF D-C DRIVES

MOTORS AND GENERATORS



POWER UNITS AND CONTROLS

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directories . . . catalogs . . .
indexes . . . etc. . . .

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☐ Send us more information and literature on Photo Panels.

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KIND OF RECORD

☐ Have representative call. Date _____ Time _____

Company _____ Attention _____

Address _____

City _____ Zone _____ State _____

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

150—Vacuum Grapple, with four suction cups, operates with cranes of all types to pick up plates or sheets. Four models have lifting capacities from 500 to 4000 lb. Cups adjust laterally. Safety light signals adequate vacuum for pick-up. Push-button release. *Noble Co.*

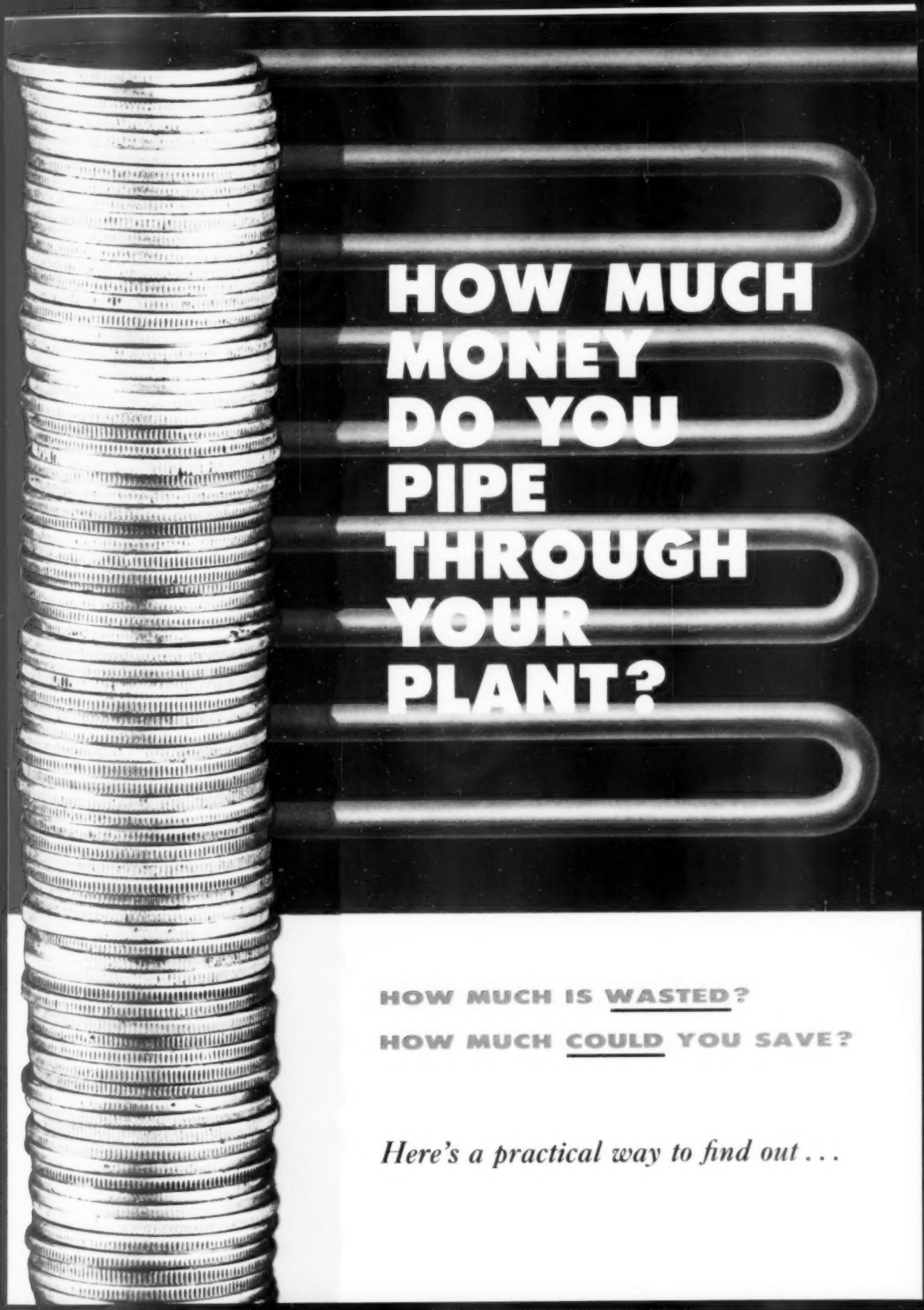
151—Valve Shut-Off Delay Unit keeps gas fuel shut-off valves open for 5-sec. period when power fluctuates or fails during thunderstorm, power changeover, etc. Eliminates valve resetting time. Comes in longer time-delay periods. Three models. *Michigan Controls Co.*

152—Air Vibrator won't jam in mounting bracket because of "free ride" design. Cuts up to 70% unloading time on covered railroad hopper cars. No need to clean out cars. Two models: 3-in. piston uses 18 cfm.; 4-in., 29 cfm. Both use 40-60 psi. *National Air Vibrator Co.*

Turn to page 124

For more facts Circle 504 on Reader Service Card

For more facts Circle 505 on Reader Service Card ➤



HOW MUCH IS WASTED?

HOW MUCH COULD YOU SAVE?

Here's a practical way to find out . . .

How modern measurement and control methods can help you save materials, time, and money

How long could a supermarket survive without modern cash registers and check-out methods to measure and control the flow of merchandise —the flow of money? The same sound business logic is being applied in more and more manufacturing and process plants in the competitive struggle to keep costs down and quality up.

Applying modern methods of measuring and controlling the money that flows through pipes in *your* plant (in the form of gases or liquids used as fuel, as raw materials, or as aids in manufacturing) makes sense for one basic reason: *It pays.*

"In-plant" metering, for instance, pays for itself quickly in better cost control, in maintaining quality, in replacing slow and expensive batching methods, and in providing dependable audit control records.

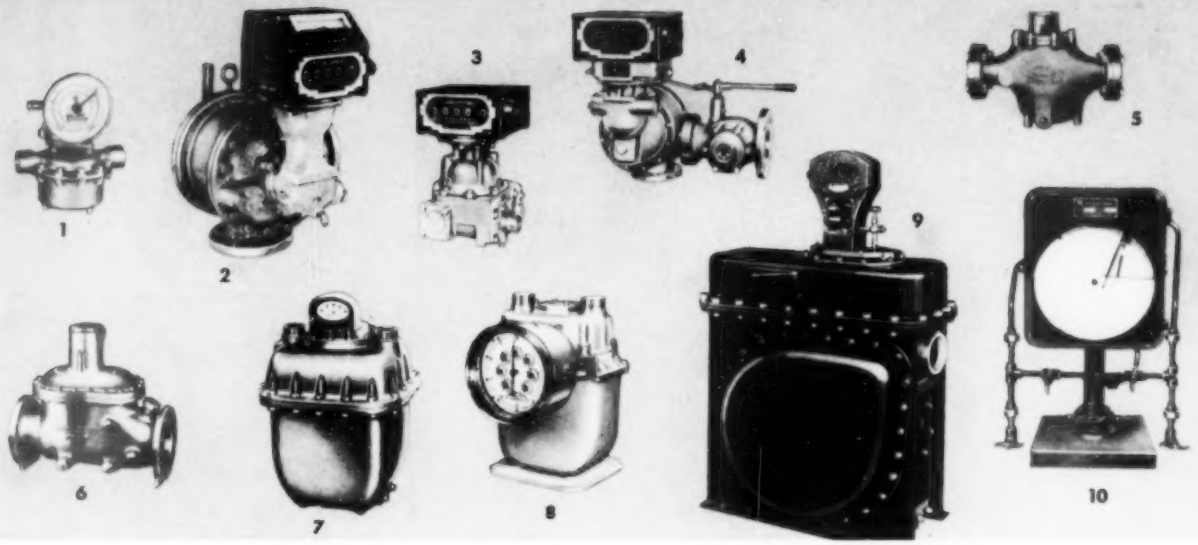
Gas pressure regulators are being used in hundreds of plants where they were never used before to insure more efficient, more economical use of both natural and "bottled" gas.

Better valves and valving methods pay for themselves through reducing waste, down time, and flow contamination.

There is hardly a plant of any kind—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved.

Certainly it's worth investigating—especially since it will cost you nothing to talk to a Rockwell Field Engineer. He represents the most complete and versatile line of measurement and control products available through any one source, and a wealth of practical know-how in modern measurement and control methods. To have a Rockwell Engineer visit you or for literature on Rockwell Meters, Valves and Regulators, send the coupon on the back page.

ROCKWELL IS THE LEADING SINGLE SOURCE FOR

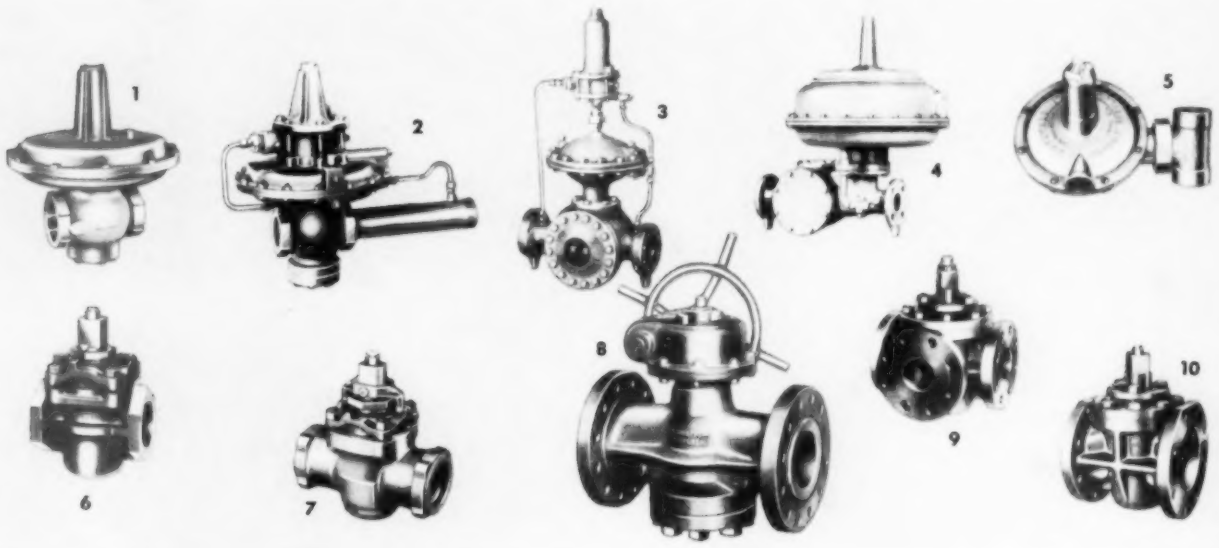


"In-Plant" Metering:

Liquid meters and gas meters are the "cash registers" of modern plants, vital in keeping costs down and quality up. Shown here are just a few of the hundreds of Rockwell liquid meters and gas meters. There is a Rockwell meter to measure accurately and economically just about anything that will flow through a pipe.

Rockwell Liquid Meters: (1) Oscillating piston meters . . . (2) Rotary displacement meters . . . (3) Reciprocating piston meters . . . (4) Meters with automatic quantity control valves . . . (5) Hot water meters . . . (6) Large capacity water meters.

Gas Meters: (7) Large capacity aluminum meters . . . (8) Consumption test meters . . . (9) Large capacity pressed steel meters . . . (10) Orifice meters.



Controlling Piped Material:

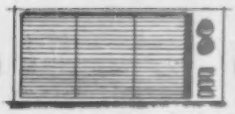
Better control of piped material (liquids, gases, and slurries) pays for itself quickly by preventing waste, assuring better utilization, and increasing safety. Here are a few of the Rockwell-Nordstrom lubricated plug valves and Rockwell gas pressure regulators that can improve piped materials handling in hundreds of different ways.

Rockwell Gas Pressure Regulators: (1) Furnace and boiler regulators . . . (2) Kiln and oven control regulators . . . (3) High pressure reduction regulators . . . (4) Low pressure burner regulators . . . (5) Service regulators.

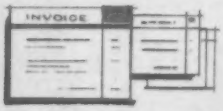
Rockwell-Nordstrom Lubricated Plug Valves: (6) Semi-steel valves . . . (7) Steel valves . . . (8) Hypresphere valves . . . (9) Multiport* 3- and 4-way valves . . . (10) Corrosion resisting valves in various alloys.

MEASUREMENT AND CONTROL PRODUCTS AND IDEAS . . .

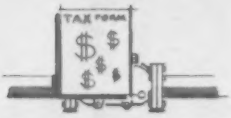
See where modern measurement and control can help you cut costs and improve production



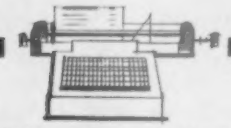
Air Conditioning: Rockwell-Nordstrom valves insure proper balancing on chill water lines; gas meters disclose efficient or inefficient use of fuel; regulators control economical gas flow.



Cost and Quality Control: Metering can often replace expensive batching methods, with worthwhile savings in time, space, and labor, and more dependable control of quality.

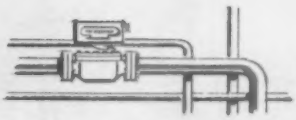


Tax Control: Where sewage taxes are based on water consumption, you can make substantial tax savings by metering water which does *not* go out through the sewage system (used in your finished product, or to water plant grounds, etc.).

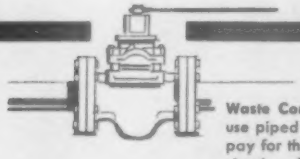


Audit Control: Gas and liquid meters are accounting machines for anything that flows through pipe; meter records provide accurate data for better cost and audit control.

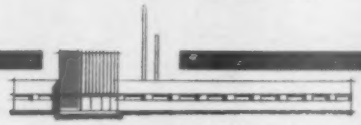
Plant Protection: Rockwell-Nordstrom valves and Rockwell pressure regulators are safety devices; they prevent leakage of volatiles and caustics and maintain safe pressure limits.



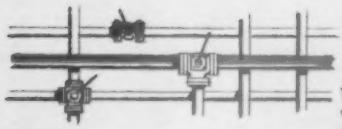
Production Planning: Using meters on gas and liquid lines throughout pilot plants provides invaluable information on efficiency of methods, equipment and design.



Waste Control: Where multiple units use piped material, individual meters pay for themselves by spotting inefficiencies. Rockwell-Nordstrom valves stop waste of volatile or hard-to-hold piped materials.



Plant Design: The best way to get full advantage of the savings made possible by modern measurement and control methods is to design these methods into your new plant or plant addition. Your Rockwell Field Engineer can help you.



Traffic Control: Rockwell-Nordstrom valves (including exclusive 3-way and 4-way Multiport designs) can give you profitably flexible routing of piped materials; often making possible the use of a single piping system for several different materials.

MAIL THIS COUPON TODAY . . . IT COSTS NOTHING TO FIND OUT HOW MODERN MEASUREMENT AND CONTROL METHODS CAN SAVE MONEY IN YOUR PLANT

Rockwell Manufacturing Company, Pittsburgh 8, Pa.

☐ Please have a Rockwell Field Engineer call me for an appointment.

Please send literature on ☐ Controlling gas pressures; ☐ Valving gases, liquids and slurries; ☐ Measuring liquids; ☐ Measuring gases.

I am concerned primarily with ☐ Light & Heavy Metal Fabricating ☐ Basic Chemical Production ☐ Chemical Processing ☐ Food, Drugs & Tobacco ☐ General Manufacturing Operations ☐ Petroleum Processing ☐ Others: _____

Name: _____ Title: _____

Company: _____

Address: _____

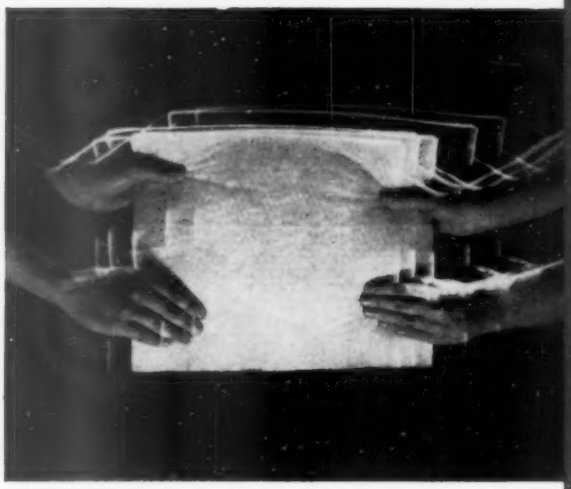
City: _____ Zone: _____ State: _____

MEASUREMENT & CONTROL DEVICES

more fine products by

ROCKWELL

Try these 3 tests with Pittsburgh Superfine Fiber Glass Insulation



PULL IT—see how strong Pittsburgh Superfine is! It's built to last wherever you install it. It retains this same strength indefinitely. Won't disintegrate or rot with age.

PRESS IT—and see how it returns to its original shape. You can compress Pittsburgh Superfine for long periods of time, yet it will always spring back to its former shape!

GIVE IT A BEATING—and see how Pittsburgh Superfine absorbs the shock, and comes back. Pittsburgh Superfine loves rough handling.

PITTSBURGH SUPERFINE FIBER GLASS is great for insulating against heat or cold or noise. It's lightweight, cuts easily to correct size . . . is rot-proof, fire-resistant . . . handles easily, avoids skin irritation . . . saves installation time. Try it!

For complete information on Pittsburgh Superfine, call your nearest PPG Sales Office, or write to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

PITTSBURGH SUPERFINE INSULATION IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh and St Louis

FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY

interchangeable with all standard JIC cylinders

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1-½ to 8 inches, the T-J Squair Head is an interchangeable cylinder which produces maximum force and efficiency, with minimum pressures . . . and is also adaptable to the use of low pressure oil as the working medium. Write today to The Tomkins-Johnson Co., Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1. One Piece Piston
2. Hard Chrome Cylinder Bore and Piston Rods
3. High Tensile Steel Tie-Rods
4. Cushion Adjusting Screw, Externally Adjustable
5. New Super-Cushion for air, or Self-Aligning Master Seal for oil (T-J Patents)
6. Solid Steel Heads and Mounting Plates Standard all Models
7. Port Design Allows Minimum Pressure Drop on Inlet or Outlet
8. Chevron Type, Self-Adjusting Rod Packing
9. Piloted Packing Gland—Absolute Alignment
10. Piston Rod, Extra Strong—Polished and Chrome Plated for Efficiency and Protection

T-J TOMKINS-JOHNSON
RIVITORS . . . AIR AND HYDRAULIC CYLINDERS . . . CUTTERS . . . CLINCHORS

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

153—Vacuum Cleaner has 3-stage bypass motor fan system that yields more power and pick-up for all wet and dry operations. Fourth fan provides separate air-stream for motor cooling. Waterlift is over 51 in. open, 75 in. closed. Motor: 1 hp., a-c, d-c. *Kent Co., Inc.*

154—Pipe Wrench works on compounded leverage principle allowing one man to do job of two. Tightens or loosens stubborn fittings easily, safely. Good for hard-to-get frozen joints. Four sizes for 2- to 8-in. pipe. Adapts to right- or left-hand threads. *Ridge Tool Co.*

155—Sludge Removing Tractor collects sludge mixed with chips, metal solids, oil and water, from sumps and settling tanks. Cuts cost of machine-tool servicing in small plants. Contents of 150-gal. tank empty by reversing vacuum pressure. *Gorske Industrial Equipment.*

Turn the page

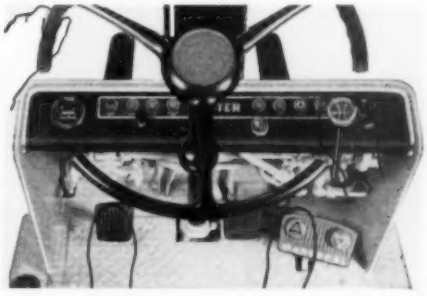
HYSTER ANNOUNCES THE ALL-NEW

SpaceSaver 30 40 50

with monotrol

...the exclusive Hyster control system that sets a new standard for lift truck safety and performance.

NEW from the big cushion tires to the top of the rugged upright, Hyster SPACESAVER 30-40-50 (3000, 4000, 5000 lbs. capacity) Trucks *lift faster* and *maneuver quicker and easier* than any other trucks in their class. "Human engineered" by Henry Dreyfuss, industrial designer, for safety and operator efficiency.



The revolutionary MONOTROL system for the first time eliminates unnecessary and unnatural driver motions. Forward-reverse and speed are *right* foot controlled by Monotrol pedal. Driver's hands are free for full-time steering and load control. Automatic parking brake is push-button controlled. Precision inching control with *left* foot pedal.

Write to

HYSTER COMPANY, P. O. Box 847, Danville, Illinois

See the new SpaceSaver Trucks with Monotrol in action at the Material Handling Show CLEVELAND— June 9-12

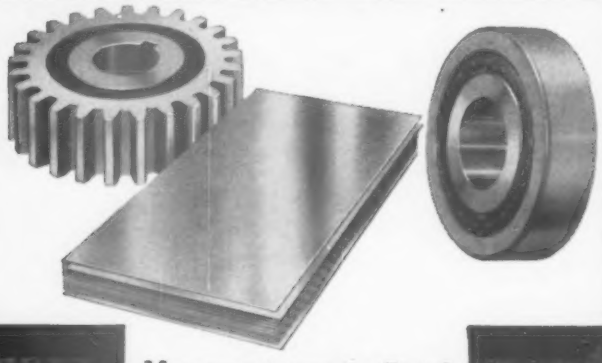
HYSTER®

INDUSTRIAL TRUCK DIVISION

MOVING AHEAD WITH INDUSTRY

Factories: Portland, Ore.; Danville, Ill.; Peoria, Ill.; Kewanee, Ill.; Glasgow, Scotland; Nijmegen, The Netherlands; Sao Paulo, Brazil; Sydney, Australia (licensee)

VALVOLINE
Tectyl
protects metals
against RUST



VALVOLINE'S amazing Tectyl rust preventives protect metal surfaces against *every kind of rust and corrosion* during storage and shipping.

Low-cost Tectyl compounds are easy to apply by brush, spray or dip and just as easy to remove. They protect metal surfaces against . . . sun and rain . . . heat and cold . . . salt air and salt water . . . humidity, perspiration and corrosive fumes.

Tectyl rust preventives meet exacting government specifications.

Write today for these two helpful Tectyl charts

1. "Valvoline Tectyl U. S. Government Approved Packaging and Preservative Chart." Gives the Army, Navy and Air Force "Specs" and applications.

2. "Valvoline Tectyl Industrial Rust Preventive Comparison Chart." Specifies applications covering the entire field.

VALVOLINE
Tectyl ALL-METAL PROTECTION
RUST PREVENTIVES

VALVOLINE OIL COMPANY, Freedom, Pennsylvania
A Division of Ashland Oil & Refining Company

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

156—"SpaceSaver" Lift Truck, with 3000- to 5000-lb. capacity, is equipped with Monotrol system which combines throttle and direction control in single pedal. Safely moves more tonnage easier and faster. Comes with automatic transmission, cushion tires. *Hyster Co.*

157—"Kee Klamps," malleable-iron slip-on fittings, make for economical pallet and storage racks, railings, plant structures. No welding, threading, or drilling. Set screw, tightened with hexagon wrench. Holds 4000-lb. direct vertical load. *Gascoignes Industries, Inc.*

158—Voltage Sensing Control for a-c voltage regulator has moving disk-measuring element which detects ½-volt variations. Built-in relay handles up to 20 amp. Input range 100 to 130 volts, 60 cycles. Plugs into standard watt-hour meter case. *Technique Associates.*

Turn the page

For more facts Circle 509 on Reader Service Card

For more facts Circle 510 on Reader Service Card ➤

For every Allis-Chalmers product there's an "Outside Story"

Self-protection against weather is built into every Allis-Chalmers product — electrical or mechanical. This "outside story" through the entire range of A-C equipment (and only A-C offers such a scope of outdoor products) *eliminates the need for costly protective enclosures in many processing operations.*

Pumps, motors, compressors, mechanical drive equipment, control and switchgear with inspection aisles — all are designed to perform 'round the calendar while exposed to the elements.

For single source availability of a tremendous scope of up-to-date equipment designed for outstanding quality control, contact your A-C representative. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

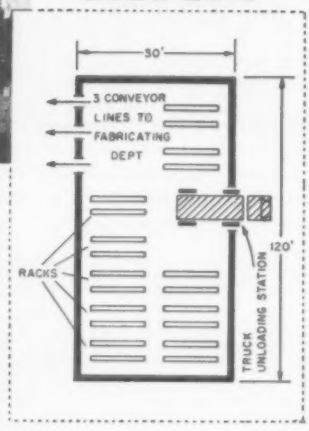
Products for Industry: Electrical Generation, Distribution and Utilization Equipment; Pumps; Compressors; Mechanical Power Transmission Equipment; Processing Machinery; Motors and Control; Water Conditioning Systems, plus Materials Handling Equipment.

Plan to stay ahead... MODERNIZE!

ALLIS-CHALMERS A-C

A-5917-GI

1 MAN ...and TRAK-RAK



handle complete warehousing operation

UNLOADS TRUCKS, STORES MATERIAL IN 1 OPERATION

When the Per-Fit Products Corp., Indianapolis manufacturer of aluminum windows installed a Chicago Tramrail TRAK-RAK unit in its warehouse, it gained 4 big advantages:

1. **Increased the capacity of existing storage area.**
2. **Reduced handling costs by permitting 1 man to handle the entire warehouse.**
3. **Kept production lines supplied with on-time material deliveries.**
4. **Handled high grade aluminum extrusions without damage.**

The TRAK-RAK unit installed at Per-Fit consists of a 1 Ton capacity underrunning crane from which is suspended an electrically operated rotating telescoping column which is fitted with a three-fork carriage. All operations of the TRAK-RAK unit are controlled by the operator, who rides with the carriage. The unit serves a series of self-standing racks equipped with arms which receive the bundled material. Because the TRAK-RAK column requires minimum operating space, the aisles between racks are very narrow.

Trucks delivering material are unloaded (top picture) by the unit, which moves over the tops of the racks (below) to the proper rack and deposits its load in 1 operation. When a particular bundle is required by production, the operator moves to the rack, picks up the bundle, and, moving overhead, travels to the conveyor lines (drawing) and sets the bundle down on the designated conveyor line.

TRAK-RAK Systems of vertical storage and handling are saving time and money in warehouses and production plants of all types. ***For complete details on how TRAK-RAK can help solve your problems, write:***

CHICAGO TRAMRAIL CORPORATION
1334 S. Kostner Avenue • Chicago 23, Illinois

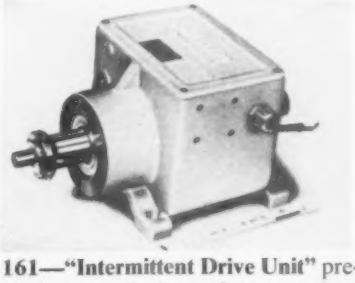
FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

159—Manual Starter has mechanically acting thermal overload that makes it impossible for operator to hold circuit closed. "Jog-Run" accessory, for precise positioning on a-c applications, is optional. Ratings: 7½ hp., 550 volt a-c; 2 hp., 230 volt d-c. *Furnas Electric Co.*

160—"Protekote" Garment, made of "Ray-Foil," protects wearer from high radiant heat. Lightweight, it is tailored to fit, has "pop-open" buttons, and underarm ventilation. Ideal for steel mills, glass and chemical plants, power generating stations. *Frommelt Industries.*



161—"Intermittent Drive Unit" precisely controls intermittent motions such as clip and bend, shear or slash, oscillate or repeat, raise or lower, index and position. Mechanizes hand- or foot-operated equipment or automates power-driven machines. *The Hilliard Corp.*

Turn the page

For more facts Circle 511 on Reader Service Card

For more facts Circle 512 on Reader Service Card ➤

Cut Fire Hazard

Replace obsolete under-capacity breakers with low cost, high speed 4.16-kv oilless units

In plant after plant, it's possible to eliminate a fire hazard . . . reduce maintenance . . . provide modern high speed interruption . . . plus adequate interrupting and continuous-current capacity with Allis-Chalmers replacement breakers.

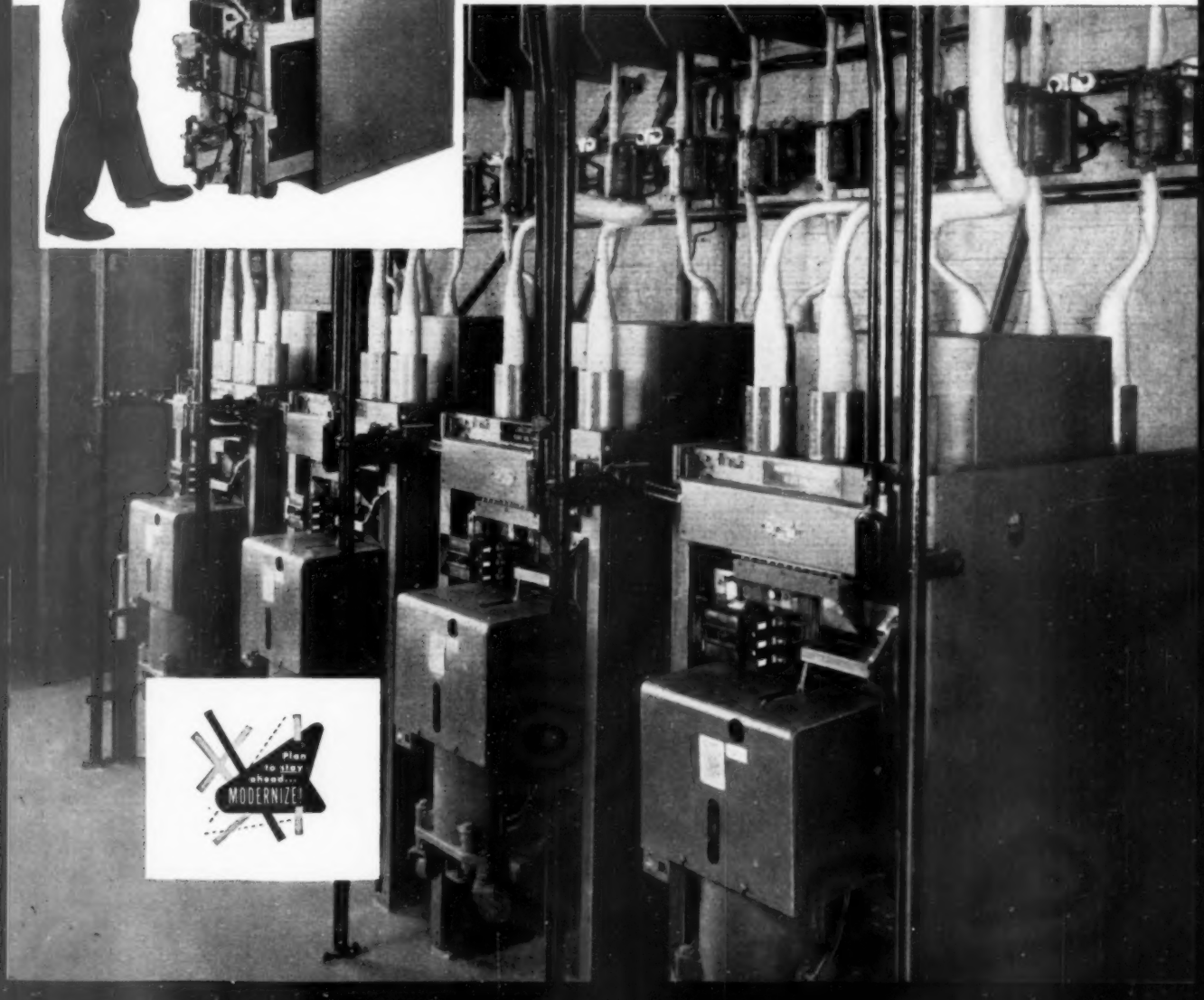
Existing cables and structures can be used with these replacement breakers. Low cost modernization can thus be provided in power-generating and substation facilities. The air magnetic breaker, together with its sturdy metal enclosure, can be installed in the masonry cell or open-type iron pipe framework previously occupied by the obsolete oil circuit breaker. Buswork, disconnect switches, current transformers, and cables can all be retained.

Modern features of breaker include: 5-cycle interruption, flame-retardent insulation, safety interlocks, full steel floor in breaker compartment, automatic shutters, one man disassembly. Interrupting capacities from 75,000 to 250,000 kva available.

For details contact your nearby A-C man or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5977-G1



This Pole-Type Warehouse cost only 2^{00} a sq. ft.

Chapman Chemical Company, Memphis, Tenn. erected this 100 ft. by 210 ft. warehouse for only $2.00 a square foot including retaining wall, floor and sprinkler system. It has plastic skylights, 4 overhead doors in front, one in back plus the usual pedestrian entrances. Aluminum Products Company, Zelienople, Pa. is the Koppers Qualified Contractor who built it.

Because it is constructed on Koppers pressure-treated poles, it will last for generations with practically no maintenance. If you are planning to build, investigate Koppers pole-type construction, the economical way to build a sturdy, permanent structure—fast.

For complete information fill out and mail the coupon today.

Wood Preserving Division C-28
Koppers Company, Inc.
785 Koppers Building, Pittsburgh 19, Pa.

Please have a Koppers Qualified Contractor call on me.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

KOPPERS **POLE-TYPE BUILDINGS**

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

162—Battery-Powered Lift Truck has low-set operator's seat for use in low headroom areas such as covered carriers, basements, etc. Capacity, 2000 and 3000 lb. Short 36-in. wheelbase permits right-angle turn in 58-in. aisle. Lifts to 111 in. *Elwell-Parker Electric Co.*

163—Tool-Appliance Tester for a-c portable electric tools, fractional horsepower motors, extension cords, and other small electrical items. Tests for normal open circuit, ground and shorting conditions. Has Hi-Pot test feature within these circuits. *Pow-R-Safe, Inc.*

164—Line Marker quickly and economically draws straight, curved, or skip guide lines. Produces up to 500 ft. of 2-, 3-, or 4-in. clean-cut lines before refilling. Paint flow is regulated by handle grip. Built-in guide; no spilling. *Cost Reduction Equipment Co.*

Turn the page

SHAFTEX speed reducer combines flexibility and dependability

Output speeds from 10 to 400 rpm, horsepower ratings from ½ to 40 — that's the scope of Allis-Chalmers line of *Shaftex* speed reducers, the last word in shaft-mounted power transmission drives.

Shaftex reducers couple flexibility with dependability. You may specify single or double reduction; you have a choice of tie rod or flange mountings.

You get these features for dependability:

Hardened gears are of single helical construction and rated to AGMA standards.

Reversible shaft features hollow-through low-speed shaft open at both ends for reverse assembly . . . can be mounted easily on driven shaft.

Positive oil seals keep oil in, dirt out.

Cast-iron housing assures precise alignment of components.

Splash lubrication provides continuous spray of oil to all moving parts.

Optional features available include overload releases and backstops. *For full details, contact your A-C representative or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.*

Shaftex and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-5982-GI

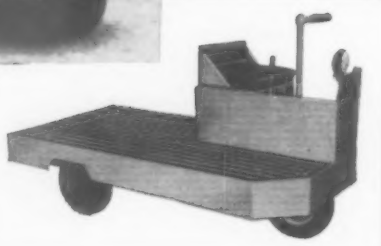
Built-in flexibility. Use the *Shaftex* reducer with flanges or tie rod . . . mounted angularly, vertically or horizontally. Locate motor where you want it. For speed variation, merely change the sheave size or use *Vari-Pitch* sheaves.

Simple belt tensioning. No need to adjust a motor base. Split-second tensioning is accomplished by a tie rod turnbuckle. This same device allows for fast belt change when required.

NEW TRANSPORTER IN TWO SIZES

1000 lb. & 4000 lb. CAPACITIES

MODEL F-40 Torque converter drive. No shifting, smooth starts. This is a big rugged 4000 lb. capacity unit that delivers heavy duty service as a freight carrier, shuttle truck, long stock transporter, and to give mobility to equipment and personnel. 28 sq. ft. deck area.

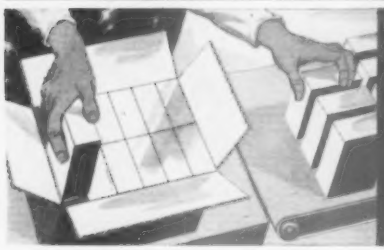


MODEL F-10 A 1000 lb. capacity truck. Carries cartons, long stock, mixed freight, maintenance supplies, baggage, fire equipment. Ideal for foremen, superintendents, inspectors, supervisors. 18 sq. ft. deck area. Wisconsin engine. Industrial type combination transmission. Price: $880 manual start; $996 electric start. F.O.B. Muscatine, Iowa.

PRIME-MOVER

Prime-Mover transporters are marketed by industrial truck distributors. Ask there -or write: Prime-Mover Co., Muscatine, Iowa.

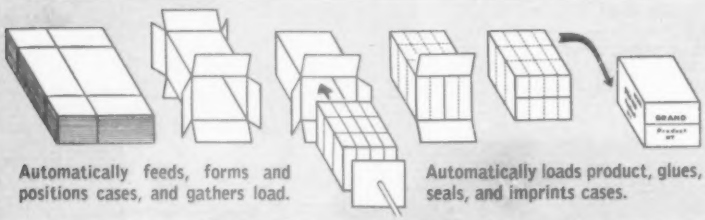
For more facts Circle 515 on Reader Service Card



Take the HANDS out of product HANDLING

Let Packomatic® equipment do any or all your casing operations AUTOMATICALLY

T.M. Reg. U. S. Pat. Off.



Automatically feeds, forms and positions cases, and gathers load.

Automatically loads product, glues, seals, and imprints cases.

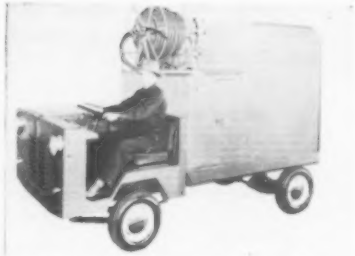
FOR CASING ROUND, SQUARE, RECTANGULAR OR FREE-FORM PACKAGES OF VIRTUALLY ANY SIZE.
If you employ even one person per shift to hand-form cases, or to hand-pack, hand-seal, or hand-imprint them, then it will pay you to install Packomatic equipment. *Write* for Bulletin 101-59 *or phone or wire* for facts on how to reduce your casing costs.

J. L. FERGUSON COMPANY, Box 1226, Phone 6-6275, Joliet 9, Illinois

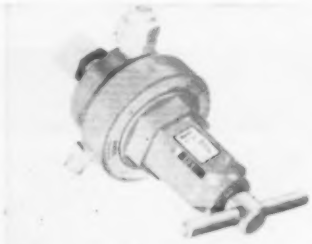
FACTORY / EQUIPMENT NEWS

Begins on page 102

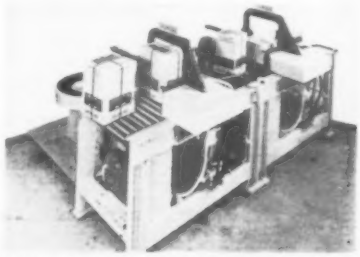
For more about these items, circle item numbers on Reader Service Card next to back cover.



165—Coolant Blender in 2 to 3 min. mixes, meters, and carries proper oil and water solution to machine tools —all in one operation. Dial sets correct ratio of oil to water, number of gallons. Four 50-gal. oil tanks, 300-gal. water tank. *Gorske Industrial Equipment.*



166—Gas Regulators, without gages, eliminate costly problem of gage breakage and replacement. Low-cost unit, for use with oxygen, acetylene, or propane, on cylinders or manifolds, withstands rough handling. Uses 150 psi. of oxygen, 15 psi. of other gases. *Linde Co.*



167—Strapping Machine, powered by electric motor, binds containers of all sizes, sheet packs, and strip steel coils. Strap is adjustable to 50-lb. minimum tension; with 3-hp. motor, maximum tension is 1600 lb In semi or fully automatic models. *Signode Steel Strapping Co.*

Turn the page

For more facts Circle 516 on Reader Service Card

For more facts Circle 517 on Reader Service Card ➤

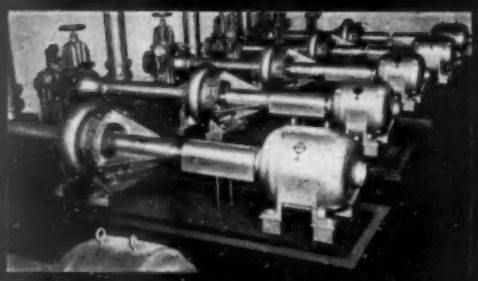
Charting one answer for every pumping need

From the smallest auxiliaries to giant, main system pumps, the range chart for Allis-Chalmers pumping units covers practically every requirement. This outstanding one-source equipment availability is a good reason why A-C should be given "first call" in modernizing your pumping facilities.

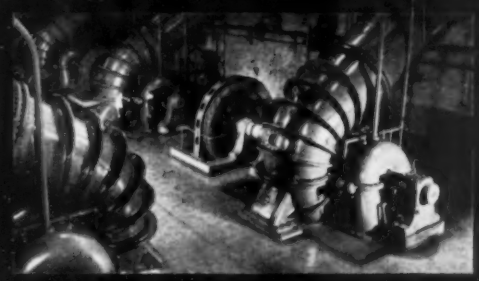
And complete line is only one "plus" for Allis-Chalmers. Teamed motors and control; customized standardization of parts and materials; engineering assistance and nationwide service are others.

Whatever your need in centrifugal pumps (and A-C builds units even beyond the chart shown), contact your representative or distributor. For additional information, write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

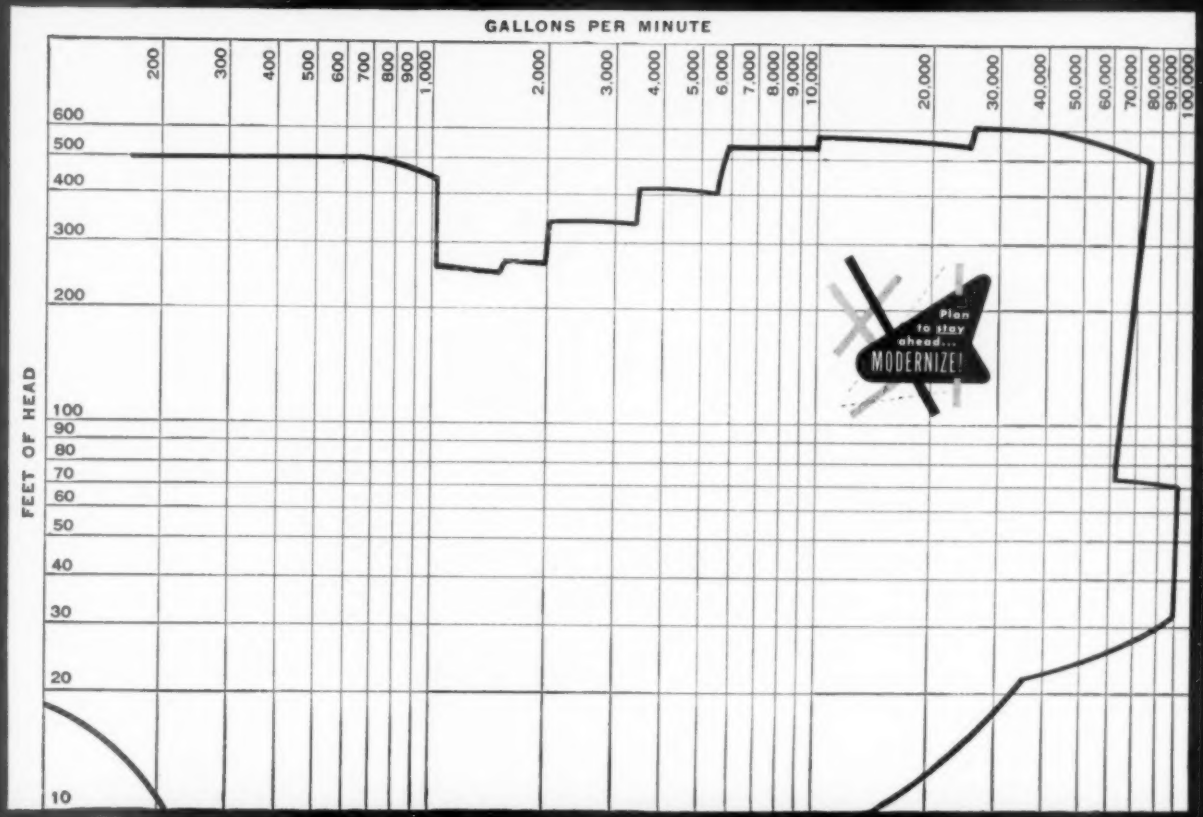
ALLIS-CHALMERS A-C A-1023-GI

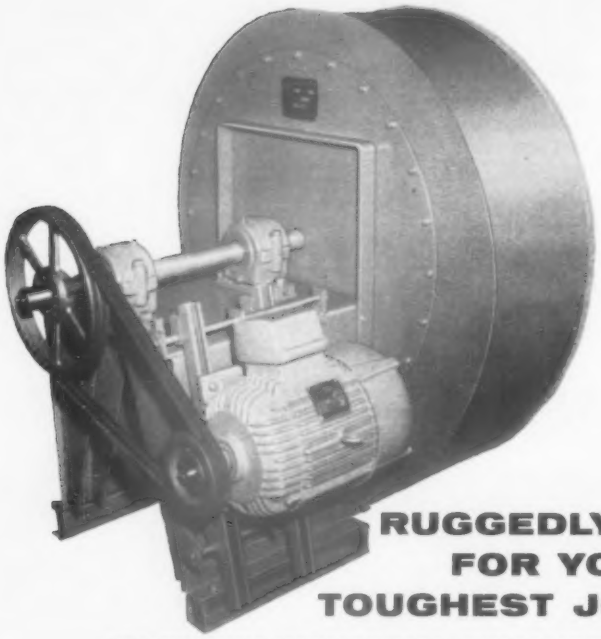


Auxiliary service is the job for six 10 x 8 A-C pumps. They are driven by Allis-Chalmers motors.



Main station application involves 12 A-C 72-inch Type SP pumps like that shown.





RUGGEDLY BUILT FOR YOUR TOUGHEST JOBS!

"BUFFALO" INDUSTRIAL EXHAUSTERS

Heat Slinger Cools Shaft on Hot Gas Exhauster.

HANDLING HOT GASES:

Heavy-duty, peak efficiency "Buffalo" Industrial Exhausters are ruggedly built to withstand such severe service as hot gas applications. Heavy steel plate housing is welded throughout. High performance is the result of smooth air flow design. Constructions are available for temperatures up to 850° F.

"Buffalo" Rubber Lined Exhauster

REMOVING CORROSIVE FUMES:

"Buffalo" Rubber Lined Exhausters have proved highly successful in handling corrosive fumes. Users report that they stay on the job up to 12 times longer than ordinary metal fans. "Buffalo" Industrial Exhausters are also available in special metals and resin-bonded fiberglass to handle most corrosive fumes.

Type "MW" Material Wheel

MOVING MATERIALS:

Special all-welded material wheels can be furnished with "Buffalo" Industrial Exhausters. The front flange type handles most materials conveyed by pneumatic systems: emery dust, saw dust, chips. The open type wheel efficiently handles long shavings and stringy materials.

For complete facts on "Buffalo" Industrial Exhausters, call your "Buffalo" engineering representative. Or write for Bulletin FI-110.

BUFFALO FORGE COMPANY

Buffalo, N. Y.

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Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

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FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

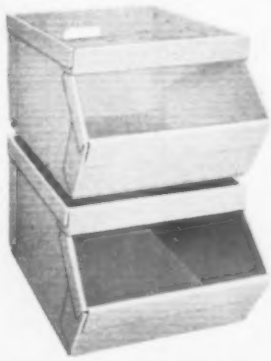
FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

168—Fork-Lift Truck, said to be largest of its kind in U. S., has 60,000-lb. capacity, fluid drive, power steering, and automatic safety features. In three models; lifts telescope from 12 ft. 8 in. to 23 ft. 3 in.; forks are 72-in. long. *Silent Hoist & Crane Co.*

169—Tachometer, a low-cost transistorized unit, releases electronic counters for other uses. Three models measure speeds without physical loading to within ± 1% accuracy—from 0 to 2000, 5000, and 10,000 rpm. Use less than 2 watts. *Electro Products Laboratories.*



170—Hopperfront Tote Boxes can be stacked without shelves or used individually. Made of chemically treated heavy corrugated paper, they are strong and rigid, low-cost. Measure 19x28 in., and 13½ in. deep when stacked. Parts can be removed without disturbing the stack. *Convoy, Inc.*

For more facts Circle 518 on Reader Service Card

For more facts Circle 519 on Reader Service Card ➤

An open motor did what no other motor could... in a mud bath

This Super-Seal motor with *Poxeal* insulation and protected bearing was not fouled by mud. An Allis-Chalmers customer, in a frequently flooded area, required a motor that could readily start even after prolonged immersion in mud.

The "dirtiest mud available" was used in conducting the successful tests in the A-C Motor Laboratories.

Motor user requirements like this form the basis for A-C pioneer-leadership in motor development. Motor buyer needs *created the most complete line of integral-horsepower motors in industry*. Induction, dc, wound rotor, synchronous, gear, tube-type and *Synduction* motors, and now *Super-Seal* motors! And, if these lines don't fill your need, A-C engineering excels in special design.

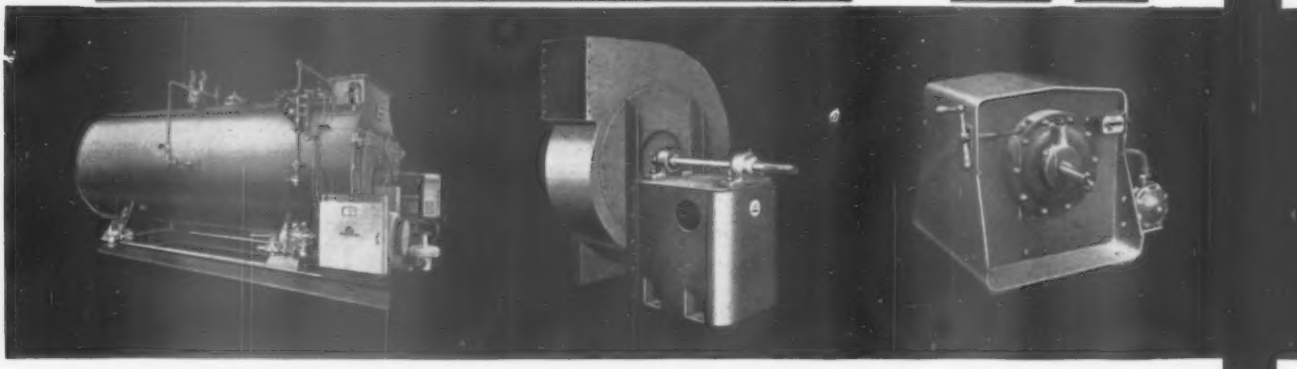
You can benefit from this pioneer-leadership by contacting your A-C representative or distributor. For more information, write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

Super-Seal, Poxeal and Synduction are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-1005-GI

Evaluating equipment for your



Firebox, scotch-type steel boilers and package units for heat, power, steam.

Industrial fans with wheel types for handling air, gases, materials, shavings.

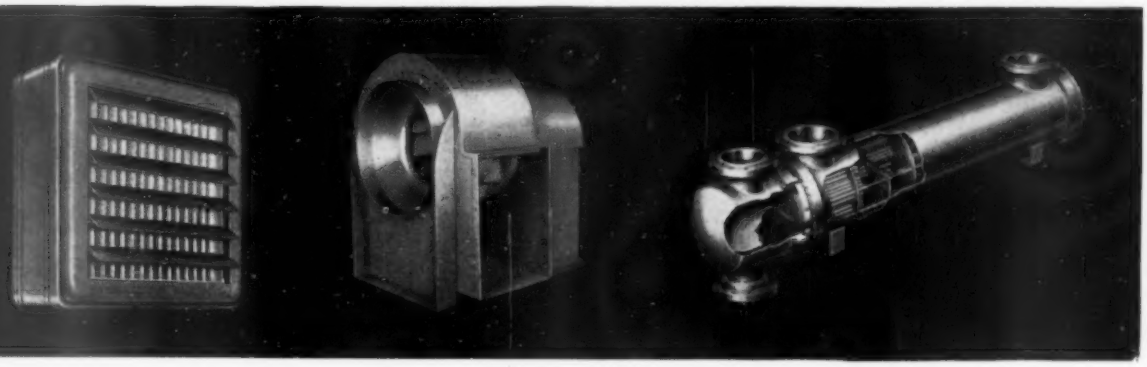
Fluid drives for stepless, adjustable-speed control of driven machinery.

One call for all

plant modernization program?

Be sure <u>one</u> source you consider is American-Standard Industrial Division if your problem involves heating, air conditioning, air handling, heat transfer, or fluid drives

HERE'S WHY: By combining three American-Standard* divisions—American Blower, Ross Heat Exchanger, and Kewanee Boiler – the new Industrial Division offers *one-source responsibility* for quality and performance in equipment that is designed, engineered, and manufactured to work together. There are engineer-staffed offices in all principal cities to work with architects, consulting engineers, and contractors with equipment selection and on-the-job problems. Contact the one nearest you. American-Standard Industrial Division, Detroit 32, Michigan. In Canada: American-Standard Products (Canada) Limited, Toronto, Ontario.



Vertical and horizontal unit heaters for steam or hot water; also gas-fired.

Self-contained ventilating units for supply or exhaust in duct systems.

Heat exchangers, condensers, and feedwater heaters for every requirement.

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FACTORY

PLANT OPERATING MANAGEMENT

CASE BOOK

WARREN J. KING
Manager, Features and Departments

"HULA HEAD," GUIDED BY STYLUS, MAKES PRECISE CUT ON THIS HONEYCOMB SHAPE . . . PAGE 140

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FACTORY
CASE BOOK

NO. 21 JUNE 1959

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Up-in-the-Air Handling

Ever see a bridge span flying? Not a common sight yet. But you'll be seeing stranger things than that gliding through the air if Sikorsky Aircraft's flying crane has anything to do with it.

The above photo shows a 5400-lb. Army bridge section dangling at the end of a helicopter-supported crane. Next stop is the span's foundation. The copter's fuselage consists of a bridge-like boom extending from cockpit to tail rotor instead of the conventional passenger or cargo cabin. Suspended from it, at a point directly beneath main rotor, is a hoist. This "skyhook" can carry up to 6-ton payloads for distances up to 100 miles.

Sikorsky engineers feel materials handling will really take to the air with this versatile craft. It can pick up manufactured products at factories, airlift them directly to airports, docks, and railroad yards. No costly, time-consuming intermediate handling. Pilot, sitting in glass-enclosed cockpit, sees in all directions, can guide loading and unloading operations, position flying crane exactly for hoist work.

Constructed as a joint project with the U. S. Navy, this craft has two 2100-hp. piston engines. Conversion to gas turbine power would increase its load-carrying capacity 2½ tons. Other crane models under design at Sikorsky Aircraft (Stratford, Conn.) will have capacities for lifting loads that range all the way from 5 to 50 tons.

For the military an added feature is that this airborne transport knows no earthbound barriers such as traffic congestion, rough terrain, or impassable jungles. Not only can the craft fly materials to remote locations, but it can also house construction crews in a giant egg-shaped detachable pod, suspendable from the hoist. Or the pod could be outfitted as a communications center or mobile repair unit.

Hula Head Cuts Honeycomb Shapes

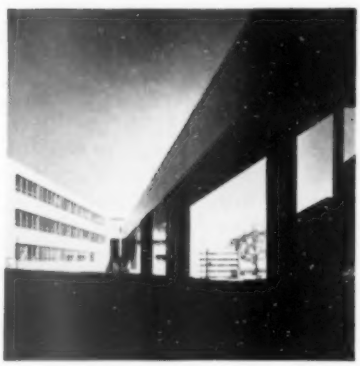
(Cover Story)

There's a new twist to machining honeycomb structures at Martin Company's Nuclear Division in Baltimore. Operators just set the modified stylus (left) on a wooden or plastic contoured model of the desired shape, then go to work. The portable cutting head (right) dupli-

cates every bump and grind in the honeycomb. This arrangement eliminates the need for a filler substance to make the sandwich core material rigid during machining.

The unit uses a standard, three-axis cutting machine equipped with a portable head and modified stylus that can convert the cutting to a five-axis operation. During machining the stylus's five pick-up points ride the surface of the model, then transmit any rise, fall, and tilt in motion to the cutter head. This versatility of motion prompted Martin manufacturing men to dub the new stylus the "hula head."

The cutter head can tilt plus or minus 10 degrees in two directions, perpendicular to each other. There is a common focal point on the centerline and end of the cutter. Tracer controls consist of a combination of pneumatic, hydraulic, and electronic components. An air motor developing 12,000 rpm. supplies the power.



New Covered Bridge

It's 25 feet above ground and all aluminum (except for the roof). This 245-ft.-long pedestrian bridge at the University of Michigan (Ann Arbor) provides doctors, nurses, and patients safe and sure passage from an existing hospital building to the university's new $8.5-million medical science building.

What's more, this above-ground location doesn't cut off access to and from the general area. R. C. Mahon Company (Detroit), manufacturer of the lightweight aluminum panels, says the fluted sections, flush interior panels, and specially insulated floors and walls used 19,000 square feet of aluminum.

Maintenance Class Takes to the Road

This is the interior of a classroom on wheels. It will be used to teach United States Steel Company employees how to take care of plant lubricating equipment. Mounted on a bus chassis, the 35-ft. steel mobile training unit was built by the company's National Tube Division. It can seat as many as 15 people for a demonstration.

Sidewall panels supporting operating lubrication system components are removable. Each piece of equipment is a duplicate of units used in all the company's plants. For "live" demonstrations the unit plugs into a built-in reservoir holding real lubricants. Trained U. S. Steel personnel act as demonstrators, switch from one type of equipment to another by replacing panels in wall mounts.

Workbenches are at each end of the demonstration area. The classroom has its own generator, but can also use a plant power source when convenient. An air-conditioning and heating system compensates for variations in weather. Last but not least, the classroom carries a movie projector, built-in screen, and public address system.

Sidewalk Foremen Get Phone Service

Sidewalk superintendents have just gained new status in New York City. At the construction site of its new office building, the Western Electric Company installed 15 telephones in three colors for their special use. The telephones are within handy reach at a special sidewalk superintendent's observation post.

Through the phones the casual expert on modern construction gets a running account of work in progress. A dulcet-voiced telephone girl delivers the report via an endless tape recording. Frequent changes in the data keep pace with construction. If superintendents have the urge to issue orders by phone, they're welcome to do so. But nobody will be listening, of course.

The spoken messages are supplemented by displays at the site. These show how the building's foundation is being tied into the bedrock of Manhattan. There's also a model of the completed structure and related information of interest to sidewalk superintendents.

Detects Even Slightest Corrosion

A portable high-sensitivity instrument helps Union Oil Company reduce depreciation costs at its Los Angeles refinery. It measures as little as one-millionth of an inch of corrosion. Is used to constantly probe corrosive liquids in the neutralizing processes.

Corrosion is a severe problem at the refinery, especially in the diethanol amine (DEA) cycling stream. Here reboiler tubes used to fail within one to three months. Now effective inhibitor usage prolongs tube life five to ten times.

The instrument, called a Corrosometer (Crest Instrument Company), detects corrosion formation rates so an inhibitor can be added to minimize damage. This way the meter prevents breakdown of parts and eliminates costly overdose of the inhibitor.

TWO-PLATFORM, ONE-DIAL SCALE WEIGHS TUBES

Weighing brass and copper tubing in lengths up to 70 feet can present a tricky problem. But not at the brand-new tube mill of Scovill Manufacturing Company, New Milford, Conn. Here (in the photo) a two-platform, single-head scale does the weighing job economically and in a minimum of floor space. Extension levers connect twin 5x10-ft. weighbridges to the 20,500-lb. capacity scale. These platforms are 20 feet apart, with the scale head located adjacent to the platform at the left. In operation, a crane deposits the tubing on the weighbridges. Then the multiple-lever system equalizes the central force exerted on the scale.

Outdoor Monorail Moves Huge Rolls

Giant, 2-ton paper rolls get the rapid transit treatment at the Cuneo Press, Chicago. A specially designed monorail system transports rolls from warehouse to printing plant at speeds up to 20 mph.

When the printing plant phones for paper, a fork truck loads a roll on a ramp in front of the monorail car. From here the entire operation is fully automatic. The car is loaded, doors are shut, and the paper is on its way.

At the printing plant the car glides to a stop at the entrance to a hydraulic elevator. Transfer from monorail to elevator is automatic. Then the elevator takes the roll to the proper floor of the printing plant. The Autoquip Corporation (Chicago) engineered and installed the handling system.

Checklists Help Make PM Effective

How valuable are checklists to the worker who performs preventive maintenance? Some claim they answer all the problems of PM. Others say they're a waste of time. At plants of Rayonier Inc. maintenance engineers believe in preventive maintenance checklists. But they don't see them as cure-alls.

Rayonier's men approach PM realistically. They realize you can get away with some sloppiness when checking industrial equipment—for a while at least. But why do this? If they decide to inspect a machine element on a regular routine, they believe in doing a good job. On the other hand, if it doesn't need checking, they don't see why an inspector should be sent to the machine in the first place. Furthermore, if inspections can be skipped from time to time without troubles arising, why not reduce the frequency of the inspection and pocket the savings? But Rayonier's philosophy is that if inspection is worth doing, it's worth the time to develop a routine to insure use of the best recognized methods.

This is where checklists can help you. And if you're worried about expense, don't be. Using predetermined time standards to study lubrication practices in a woodmill, Rayonier engineers discovered the time spent marking checklists comprised 6% of the total time of covering lubrication routes. Travel and preparation time, on the other hand, accounted for 60% of total time. Thus the expense of marking checklists is insignificant compared to other non-productive delays.

The checklists "locked in" the best route for lubricating mechanics. These were developed as a part of the lubrication study. And by following the shortest prescribed route and other methods improvements, Rayonier got better lubrication coverage with a 46% reduction in manhours.

In addition, checklists help Rayonier foremen make sure workers use good methods and short routes consistently. Without a definite procedure to follow, mechanics stray from methods originally established. This doesn't happen because mechanics deliberately alter their practices. They are human and forget. And trials of different lubricants or frequencies cloud the original instructions. Also production people and other mechanics "suggest" changes. Thus good methods can easily die by default.

The current reference offered by the checklist is needed to insure continuing understanding of what is expected. It's the "official" guide that can and should be changed to incorporate improvements and newly accepted practices. Thus it does much at a low cost.

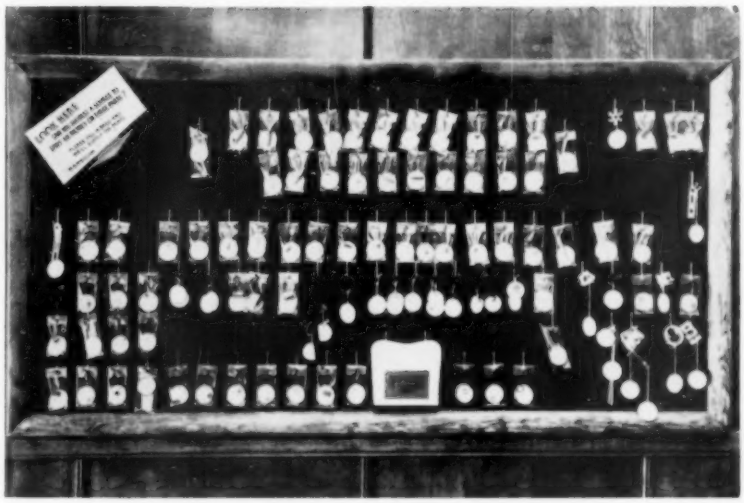
Many managements eliminate such devices as checklists on the pretense of "cutting red tape." Or they "eliminate paperwork." But to make these decisions without detailed information and justification is a mistake. Conversely, going "whole hog" to the other extreme by

trying to make checklists do everything is an error, too. Checklists can't substitute for good supervision. If you make out a good checklist and then ignore the operation, the checklist and the operation will suffer. Similarly if you don't train your men in the use of checklists and don't follow them up with good supervision, you might as well save the time it takes to develop the checklist.

Naturally, checklists can ease the load of supervision and allow supervisors to follow up less frequently. But as soon as the supervisor gets booby-trapped into thinking he doesn't have to follow up the checklist at all—look out. If the supervisor doesn't care, the mechanic won't care. Thus the checklist will save some time for the supervisor, but it won't save *all* his time.

Rayonier's conclusion: Checklists are beneficial if used properly. But they should be limited to tasks where good performance is important and an oversight can be serious. They should never be used as "window dressing." If you have inspections within these limitations, you might need a checklist.

Source: Tom Mostyn, Executive Staff Maintenance Engineer, Rayonier Inc., Port Angeles, Wash.



DISPLAY BOARD INVITES LOWER BIDS

And so far it's racked up a 20% saving in the purchase of some parts for the Hancock Manufacturing Company. The board greets salesmen as they enter the lobby of the company's Jackson (Mich.) plant. Enclosed in transparent plastic envelopes and mounted on the board are parts Hancock uses in assemblies. A sign in the upper left corner poses a question, "Can you suggest a source to save us money on these parts?" That's enough bait for any good salesman. Then all he does is pick up a card provided and submit his bid to purchasing. During the board's first four weeks, 16 companies bid on 117 parts. And not one sample disappeared.

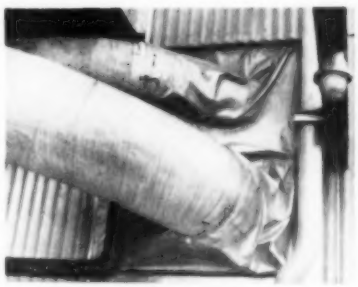
Rectifiers Step in for Batteries

No batteries needed in the transfer control circuit of this substation. It's the first dual-ended unit using silicon rectifiers to operate the power transfer breakers. In most substations this energy comes from batteries.

The substation supplies power for a new multi-million-dollar polyester film base manufacturing facility at Eastman Kodak's Kodak Park plant in Rochester (N.Y.). The process operates round-the-clock on a seven-day basis.

Here's how the system works to insure service continuity: Power from two different 13.8-kv. sources feeds two 2500-kva. transformers at both ends of the substation. In standard fashion the 480-volt transformer secondaries are connected through normally closed breakers to a common bus with a normally open tie breaker in the center. If power from either transformer fails, breaker at that end opens and tie breaker closes.

But instead of space- and maintenance-demanding batteries, Kodak engineers working with I-T-E Circuit Breaker Company (Philadelphia) developed a power transformer system using low-voltage d-c control bus. Silicon rectifiers solidly connected to the two power sources supply the d-c. Thus as long as either source is energized there's energy to close the tie breaker and open the breaker at the faulty or dead end. Costs for the new system are competitive with those of batteries. And since d-c bus voltages are standard, relay and coil designs are the same.



Flexible Fabric Seals Wall Holes

Even though steam and water pipes expand and contract at South Carolina Electric & Gas Company (Columbia), the plant interior is completely weatherproofed. Problem of waterproofing wall openings through which pipes enter was solved with a neoprene-coated nylon fabric. Rigid materials had been damaged by pipe movements.

The seal around pipes withstands high heat and humidity, remains flexible without cracking despite stress and strain of moving pipes. Clamping bands hold the nylon fabric around pipes. Clamping flanges and strips secure it to walls.

Silver Dollars Spread Message

When the employees in this photo started spending their pay, the town of Beatrice (Neb.) was flooded with silver dollars. In all, 15,000 of them were passed out. They represented the weekly payroll at the new Formfit Company plant there.

Result: Before many days passed, every citizen and merchant had a clear idea of the economic impact of the new plant. In fact, they expected the silver dollar flow before it came. The local Chamber of Commerce pushed the program from the early planning stages. And that's where the Formfit project differs. Most companies pay their employees in silver dollars to convince local businessmen they are assets to the community. But in Beatrice the company was already recognized as an asset. And local business people welcomed—even helped promote—the silver dollar campaign.

Merchants encouraged rapid distribution of the silver dollars by featuring Silver Dollar Specials. Window banners and ad mats were supplied to retailers through the Chamber of Commerce, in cooperation with Formfit. Salesclerks in stores and all Formfit personnel called further attention to the event by wearing Silver Dollar Days badges. And to provide added interest among Formfit co-workers, each one at the Beatrice plant received a silver dollar as a bonus.

Building up to the event, the local newspaper—the *Sun*—sponsored a Silver Dollar Queen Contest. The winner was awarded a free wardrobe furnished by Beatrice stores and Formfit, plus an expense-paid vacation for two in Kansas City, courtesy of Frontier Airlines.

Radio station KWBE whipped up further excitement by conducting a Treasure Hunt for several days in advance. The "treasure" was a red velvet pouch containing a certificate for 25 silver dollars.

By the time Silver Dollar Days rolled around, every citizen in Beatrice was interested in the event. Any fears that Formfit employees wouldn't spend their silver dollars were quickly dispelled. One gas station operator collected 80 silver dollars within two hours after the plant closed on payday.

Remember, you don't have to be in trouble in your town to have a "Silver Dollar Payroll" pay off.

How Specialists View Unions

One engineer in five thinks some form of collective action is desirable for him. The same goes for scientists employed by industry. These findings come from a survey of 10 major business firms by the University of Michigan (Ann Arbor).

Among engineers and scientists who favor some kind of collective bargaining, half feel unions are their best form of representation. The rest believe professional societies should get into the wage and salary act, should collect and distribute information on salaries and such matters for their members.

That's the minority side of the coin. On the other side are the engineers and scientists who oppose collective action. Of those surveyed, 50% were strongly opposed to any kind of collective action. Another 29% reported they were mildly opposed to it.

In addition, the research revealed that there's no significant relationship between a man's rated performance and his attitude toward collective action. It also showed that salary and treatment by management are the main influences on attitudes toward collective bargaining. The wide differences in attitudes in the various firms studied were found to be based largely on these two important factors.

Lights Call Help

These "call" lights bring the right maintenance man arunning. They're located directly behind each automatic welding and forming machine on the tank-shell fabrication line at Westinghouse Electric's new transformer plant, (Athens, Ga.).

Purpose of the "call" gimmick is to keep machine tenders at their machines instead of running around looking for a maintenance man, thus reduces assembly-line stoppages. The four vari-colored light bulbs set in a panel are visible from the aisle. Workers control them from a switchbox within easy reach.

When there's trouble a green light is switched on if an electrician is needed. Violet summons a mechanic, blue a set-up or relief man, white an inspector.

1. HANDLING 15,000-LB. COIL IS EASY.

2. TWIN TRUCK TEAM POSITIONS BIG VALVE.

3. ROOF MATERIAL GETS HIGH LIFT FAST.

4. RAW STOCK GETS INTO PLANT FASTER.

Lift Trucks Do Maintenance and Production Jobs

Lift trucks—standard or tailored to specific needs—can solve all sorts of plant transportation problems quickly. Not only on production jobs. On maintenance jobs as well. So if you're looking for time- and money-savers, here are four ways trucks (Yale and Towne Manufacturing Company) do out-of-the-ordinary jobs in out-of-the-way places:

1. This split ram truck does a two-fold job at American Can Company, Tampa, Fla. It transports heavy coils, laid horizontally, to the upender (Photo 1), then takes them, laid vertically, to the production line. The truck deposits the palletized metal coil on a rotating device. Coil in horizontal position is upended. Pallet is pushed to rear and out of the way.

Truck operator actuates rotator by remote controls in his left hand. This turns coil 90 degrees to a vertical position so hole faces truck. Rams, formerly split to carry palletized coil, are now closed to pick up coil in usual manner. Finally truck places coil on machine mandrel at head of can-making line.

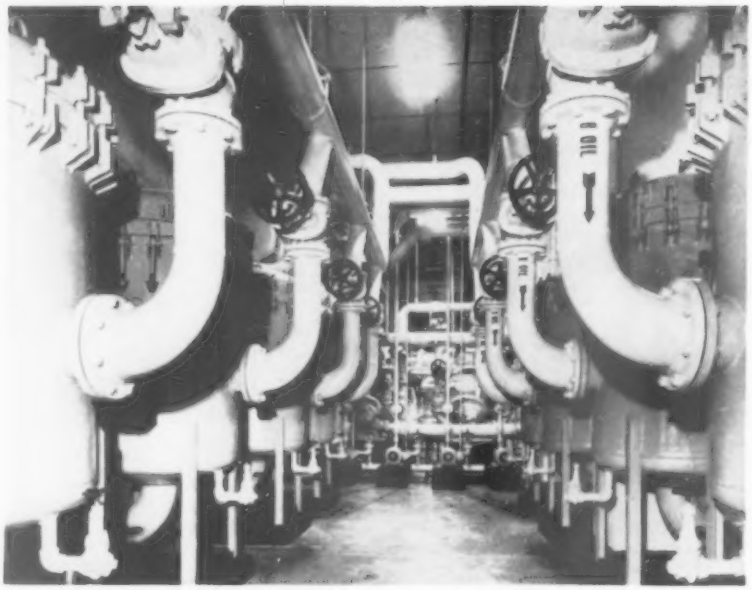
2. Trucks in tandem solve the problem of installing heavy valves in cramped operating area for Ambrose Augusterfer Corporation, Philadelphia. Installation takes place in the basement of a new water filtration plant for the City of Philadelphia. Here 10,000- and 8000-lb. capacity trucks joined forces to maneuver valve through tight aisles and extremely close overhead clearances. Then, at the site, trucks held a 15,000-lb. valve in exact position for permanent installation.

3. Plant construction got a "lift"—and a saving in both time and costs. It was done with this 15,000-lb. capacity truck. Here truck is shown raising plywood panels in small lots at the new plant of Crane

Hoist Engineering Company in San Leandro, Calif. The Clarewood Construction Company (Berkeley) first used the truck to place wood purlins in position, then put it to work supplying the roof crew. This eliminated extensive, time-consuming hand-carrying of components to the roof.

4. The underworked lift truck you see in Photo 4 operates only 20% of the time. Yet it has speeded processing of baled rags 400% at National Vulcanized Fibre Company's Newark (Del.) plant. The 4000-lb. capacity truck unloads, stores, and feeds bales to a cutter-conveyor with the aid of four men.

The truck is equipped with a bale clamp, has a total mast extension of 144 inches (it's 71 inches closed). It carries two bales of rags at a time, stores or withdraws them in two minutes. It formerly took a seven-man crew five minutes to do this operation with each bale. And as a bonus, the fully extended mast permits stacking to the ceiling, thus increases storage capacity 100%.



DUAL SYSTEM FEEDS, FILTERS COOLANTS

Here's the way Scovill Manufacturing Company (Waterbury, Conn.) gets better mileage out of coolants on a cold strip mill. A twin-coolant system not only feeds coolants but also filters them for re-use. One system feeds mineral-oil coolant for rolling aluminum sheet. The other handles a soluble oil and water coolant for brass. Either system can pump 750 gpm. A series of tanks, pipelines, and cartridge-type filters restores contaminated coolant to purified form and returns it. Feeding and filtering is continual in the custom-built system (Dravo Corporation, Pittsburgh).

Cooled Four Ways

Four ventilating methods help get rid of man-killing heat fast at this glass-container forming machine at Owens-Illinois' Atlanta plant. The six-position machine turns out gallon-size containers. The melter operates at over 2750 F.

Operator cooling comes from the following:

• Man-cooler. That's the 12x30-in. rectangular outlet behind operator. It blows cool air at average of 2500 fpm. at distance of 2 feet, 1900 fpm. at 4 feet, 1650 fpm. at 6 feet. Louvers deflect air as needed. Smaller 10x21-in. unit blows across rear of machine. Air temperature is lowered by evaporative cooling units in basement.

• Radiant heat shield. Placed directly in front of operator, it deflects machine's 2750 F. heat.

• Floor grating. Cool air draft from courtyard below the machine is sucked up through the basement by rising hot air.

• Louvered windows. Adjustable vents move in 180-deg. arc, so fresh air keeps flowing into work area.

Source: Harold Ottesen, Plant Manager, Owens-Illinois Glass Company, Atlanta, Ga.

Conserving Water Pays Off Two Ways

An estimated 72-billion gallons of water was used by General Motors plants in the U. S. and Canada for various industrial processes, heating, and cooling in 1957. But, according to David Milne, materials and processes supervisor for GM Production Engineering Section, this figure would have been much greater without GM's water conservation program.

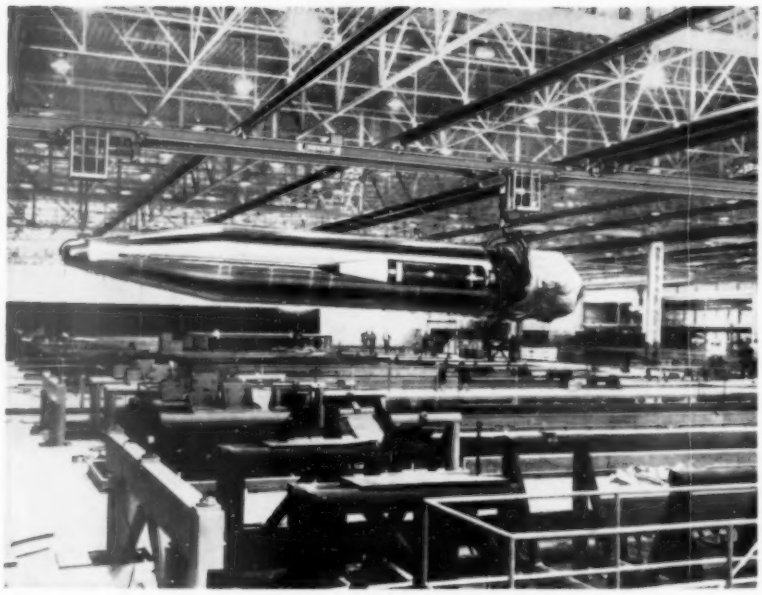
GM's water conservation effort produces two-way savings. For plant management it means reduced water charges. And for over-loaded public water and sewer systems, it means less work. To reach these objectives, the program took the following four-phase approach:

1. Review plant utilities. Then determine conservation policies for all of them, including fuel gas, air, electricity, steam, and water. Such surveys resulted in immediate savings by shutting down or curtailing water consumption when plant facilities were not in use.

2. Tell employees and supervision what the plant is trying to gain by its water-saving program.

3. Install preventive maintenance to check routine items like leaky valves and faulty controls.

4. Study water conservation from a long-range view. Here plant engineering committees worked closely with designers and purchasers of water-using equipment. They emphasized factors affecting cost of



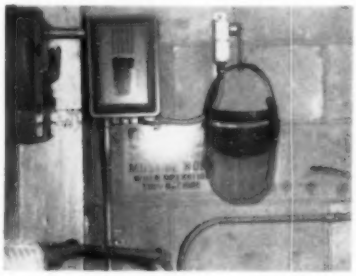
MOVES MISSILES ALL OVER 5¼-ACRES

Big Atlas missiles get a big boost from this overhead crane system at Convair Division's Astronautics assembly plant in San Diego. The system transports the ICBM missiles 40 feet above the floor from one assembly point to another. Built by Crane Hoist Engineering Corporation (Bell, Calif.), the crane system completely covers the 5¼-acre plant area. Four 90-ft. crane bridges span the 360-ft. width of the plant. And these units can be joined together to form two 180-ft. spans for transporting long sections. Crane bridges have 20-ton capacity, speed of 150 fpm.

water running through various pipe sizes and the necessity for engineering more sensible water usage into industrial equipment.

Successful? You bet. To prove it, here are some case histories from several GM plants:

- Water consumption decreased 14.7% the first year of the water conservation program at one plant. In this same period machinery and equipment increased 21.8%, floor space 6.2%.
- An overstrained municipal water supply situation was relieved at another plant by redesigned recirculating water systems. Automatically controlled water flow to individual machines plus careful recovery and return of steam condensate saved the municipality over 360-million gallons of water annually. Also cut annual plant water bills $90,000.
- The simple reduction of spray-nozzle orifice size saved $5000 a month in water charges at one site. Nozzles in a rinsing operation now use ⅛-in. openings instead of ¼-in.
- In a plating plant, situated by a plentiful water source, supply was restricted by an inadequate public sewer system. Here counterflow rinse tanks and automatically timed sprays incorporated in all plating operations solved the problem.



No Glasses, No Power

Here's a sure way to make workers wear safety glasses or shields. Connect the hook for hanging up glasses and shields to a snap-action type switch. Thus when something is on the hook, the adjoining machine gets no power.

The arrangement is especially effective for grinders and drillpresses at United States Gypsum Company, Shoals, Ind. The lever-operated, normally closed switch is in the starting circuit of the machine. It's in an industrial enclosure and has a wire hook attached to its spring-loaded arm. When the hook is depressed the switch is open and the motor won't start.

Robot Moves Hot Materials

Mobot Mark I is a mechanical man with five eyes, two arms, and four wheels. He has been developed by Hughes Aircraft Company (Los Angeles) for handling radioactive materials. And he may well be the first "man" on the moon.

The new mechanical man looks more like a fork-lift truck than a Frankenstein monster. Takes orders from a man at a TV console working at a safe distance. Is part of a wide range of new equipment developed by Hughes for radiation laboratory research.

When Mobot enters a hot area deadly to man, its pilot, sitting before a pushbutton panel board and console of monitors, directs its movements. Mobot's TV-camera eyes send the control operator a closed-circuit image of what the machine is doing. At the same time, two additional cameras inside the room are transmitting an over-all view of the laboratory area.

The device can be equipped with auxiliary tools such as wrenches, screwdrivers, hammers, and shears for dismantling radioactive equipment. Mobot now performs a wide range of lifting, inverting, and placing operations. Its electro-pneumatic fists and fingers can adjust equally well to a feather-light touch or to a 200-lb. squeeze.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be sure to include. We'll edit for the Case Book. Contributions accepted will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

YOU BE THE ARBITRATOR

THE CASE OF

The Qualified Candidate

Out of the experience of the American Arbitration Association

An opening occurred for a Class B inspector on the fractional horsepower motor line. Management decided to offer the spot to one of the bench assemblers who seemed to have the best qualifications. Only trouble was he didn't have as much seniority as Paul A., another assembler who wanted the job.

"The union contract calls for the seniority rule in promotions only where both applicants are qualified for the job," explained the foreman. "I admit either of the men could handle Class B inspection. But we want to give the job to an employee who can advance still further. The man we want goes to night school, is learning to read schematics. Thus we could push him into a Class A spot in the future."

"I'm not interested in the future," Paul said, as he filed a grievance. "The contract requires only qualifications for the job to be filled right now. That's all that counts for this opening."

Eventually, the case went to arbitration. Suppose you were the arbitrator. How would you rule?

For the actual decision turn to page 154

Gage Boosts Quality

An ultrasonic resonance gage is saving Bridgeport Brass Company (Bridgeport, Conn.) hundreds of dollars. It provides a non-destructive test method that's simple, fast, and —most important—reliable.

Bridgeport Brass developed a rim-to-rim laminated structure for its new line of kitchenware. The structure has an inner copper core that's protected by two outer stainless steel skins.

After lamination, the finished blank is formed and buffed to a high gloss. But if there's any discontinuity in the bond, the blank is likely to delaminate during drawing, or the defect may show up as a streak or blister after polishing. This means the shaped disk must be scrapped.

To catch bad blanks before forming, Bridgeport Brass uses a Vidigage ultrasonic tester (Branson Instruments, Inc., Stamford, Conn.). Right after laminating, blanks are inspected with the Vidigage. Each blank is coated with a thin film of oil or glycerine for good sonic energy transmission. On a 17½-in. disk, the inspector hand-checks about 60 points in a spiral pattern. The 12-in. disk requires 30 to 40 test points. If a defect in the blank is indicated, the inspector marks it for special handling.

Only one operator is required to handle random production testing with the gage. Semi-skilled personnel can be quickly trained for the job. Readings are clearly visible (even at a distance). The gage is portable—weighs just 60 pounds.

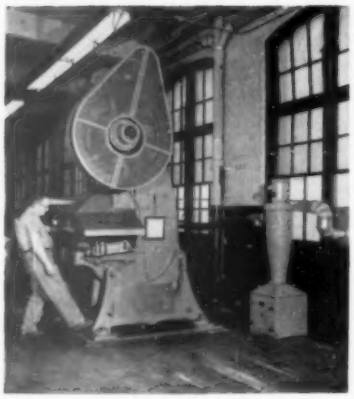
New Baskets Last 25 Times Longer

Twenty-five to one. That's the record of the stainless steel pickling baskets at Zallea Brothers' Wilmington (Del.) plant. Formerly the company used plastic-coated carbon steel baskets. But within six months the plastic required extensive repairs. Minor repairs occurred every four to six weeks.

Not so with the stainless baskets. When first used in June 1956, life expectancy was seven years. But the original units are still going strong—seem to be heading for even longer life.

Baskets carry stainless steel bellows-type expansion joints and other assemblies through pickling or passivating baths following annealing. Parts get either a hot sulfuric acid bath followed by a hydrofluoric-nitric acid pickle, or a passivating treatment in nitric acid.

Baskets contact the acids about 20 hours a week. Yet they have not required any maintenance or repair work so far. And, unlike the old carbon-steel baskets, there's no need for stand-by units. Only the baskets required for the operation are needed. The baskets were designed by Zallea Brothers and made at The Cambridge Wire Cloth Company, Cambridge, Md.



No Degreasing With New Lubricant

The enclosed die area on this press, along with a different die lubricant, eliminates a degreasing operation at Westinghouse Electric's Sturtevant Division (Boston). From the enclosure a special ventilating system draws off noxious fumes from the Chlorothene lubricant (Dow Chemical Company).

The new lubricating system gives Westinghouse two major benefits:

- Direct labor savings of about $2000 a year from elimination of the degreasing operation.
- The thin, fragile parts involved are far less prone to damage because of less handling. They'll bend with any slight mishandling.

As for costs, Westinghouse figures the 500-cfm. exhaust fan (to draw off the fumes) was $165. Although Chlorothene is a more expensive lubricant than kerosene ($1.91 per gallon vs. 22¢), the extra cost is more than compensated for through labor savings. And Westinghouse expects to use 25% less of the new lubricant.

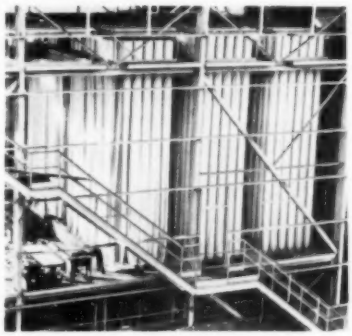
Booklet Tells All

If the weight of the printed word is any measure of management's interest in employees, new employees at Heald Machine Company (Worcester) must feel secure in their choice. The company's new booklet for new hires contains absolutely everything an employee could want to know about his company.

It spells out just what the employee can expect from the company —and what the company expects in return. It tastefully starts explaining each subject with the "why" of the procedure or rule rather than with the procedure or rule itself.

Here are some of the many headings that show the completeness of the book: payroll deductions, factory rates, scholarship assistance, moving up the ladder, service emblems, workmen's compensation, leave for Boy Scout work, solicitations and contributions, personal conduct, and company operations. This final one explains sales and service, engineering, manufacturing, and plant engineering—to name a few.

Will employees read all of these data? We doubt it. But the bulk of the booklet, and the samples the employee does read, should convince any new worker he did a wise thing when he applied at Heald.



Dust in the Bag

No more belching smokestacks at Bethlehem Pacific Coast Steel Corporation (Seattle). A new "Bag House" takes care of that. It houses an efficient dust and fume collection system that controls the smoke, fumes, and soot from two 100-ton-capacity arc furnaces.

This is the first steel plant in the West with such a smoke-control facility. The Therm-O-Flex filter system (Western Precipitation Corporation, Los Angeles) works like a huge vacuum cleaner. It collects fumes and smoke in special 25-ft. long bags with a 1-ft. diameter. Bags are made of silicone-treated woven glass fabric that withstands temperatures to 550 F.

The complete unit of 792 bags is enclosed in the "Bag House." Every half hour each bag is collapsed and the material clinging to the sides falls into hoppers below. Then a special conveyor carries it away.

CASE BOOK CAPSULES

Highest-capacity radioisotope machine in the U. S. radiographs heavy castings at Cooper Alloy Corporation (Hillside, N. J.). Uses nickel-size Cobalt 60 wafers as radiation source to insure perfection in valves and fittings.

Acid-resistant linings of epoxy resin recondition metal pipelines while in place, says Centriline Corporation, New York City. Machine-carrying resin travels through 24- to 144-in. pipes. Applies resin with high-speed revolving head, then smooths it.

Chemical mixtures, flavors, and aromas can now be broken down to ultra-pure components with a new electronic machine by Beckman Instruments (Fullerton, Calif.). "Megachrom" separates and collects samples in volumes 100 times larger than existing devices.

Data accumulation efficiency increases with newly installed G-E computer system at U. S. Steel's Fairless Works (Fairless Hills, Pa.). Computer collects tinning-line data on two independent parallel sections. If one fails, the other continues to operate.

Distilling sea water into fresh at less than 85¢ per 1000 gallons is now possible with a Griscom-Russell Company (Massillon, Ohio) distillation plant. Cost data are based on plants processing roughly 2-million gallons daily.

A feminine voice from the depths of a metering box provides voltage readings, including polarity and decimal values. That's how a digital voltmeter by Cubic Corporation (San Diego, Calif.) registers measurements. It also uses the conventional dial method.

Electronic "eye" inspects and controls color accuracy in production of styrene molding compounds at Monsanto Chemical's Plastics Division, Springfield, Mass. Eliminates errors caused by human eye's failure to match colors in changing light conditions.

Hook Hikes Hoppers

A simple, four-pronged hook makes lifting scrap hoppers from floor pits an easy job in machining departments of Greenlee Brothers & Company, Rockford, Ill. Prongs of shop-built hook fit into eyes welded to sides of hopper. Then a fork truck (photo) lifts hopper from pit. One hook is kept at each pit.

Once hopper is out of pit, operator removes hook, carries hopper on truck forks to an outside scrap bin. Here he trips a lock-handle on rear of hopper to dump load. Hopper then returns to upright position, locks automatically in place.

Each in-floor pit holds four of these self-dumping hoppers (Roura Iron Works, Inc., Detroit). Top of hopper is flush with floor. This simplifies job of dumping scrap from wheelbarrow.

Fast Snow Removal

Quick snow removal from parking lots and loading docks may be here at last. Esso Research (Elizabeth, N. J.) has been testing a new snow-melting system at a 100-car parking lot in Lawrence, Mass. Claims it can be used commercially.

The system uses a high-velocity oil burner located next to a 5x12-ft. pit. This forces hot gases from combustion downward into the water-filled pit to agitate and heat the water-snow mixture. As snow is pushed into the pit, it melts instantly. The water then flows into sewer vents in the pit.

On the basis of a one-year test Esso engineers obtained the following statistics on the system: It uses about 98% of the oil's gross heating value. Oil cost averages about 25¢ per car space for an 8-in. snowfall. It takes about an hour for the melter to digest a 2-in. fall on a ¾-acre lot.

First model cost $7000. But this figure included some development expenses, too. Thermal Research and Engineering Company (Conshohocken, Pa.) has been licensed to build and market the device.

Managers Train College Men

Many managers spend much of their time training and teaching subordinates. And partly because they're skilled teachers, they're successful managers. Plant Manager J. R. Carr of American Can Company (San Francisco) is no exception. He usually teaches his workers about the plant's operation. But now Plant Manager Carr and other Canco managers are also teaching as a benefit to the community.

They're helping staff a special course for senior business administration students at San Francisco State College. The company claims its participation in the program is based on a desire to make a social contribution in developing trained people. And the fact is, the managers who participate get valuable training themselves.

The company's manager-teachers are working with a three-man team of professors. The professors present the theoretical side of organization and management. The managers give the practical details of their own set-up. The course also offers plenty of time for questions.

About 20 Canco managers participate in each semester-length course. Plant operating managers are prominent on the list. But sales, accounting, purchasing, and research departments are also represented. As you might guess, field trips to local company plants are part of the course, too. These trips give students the feel of shop and office operations for themselves.

Can the manager-teachers generalize the principles of management differently from the college professors? Probably not. All three professors have practical experience themselves. But the managers do have the advantage of an intimate knowledge of their own operations in details. So they can answer questions with the authority of men in the know—right now.

Do students like it? Yes. They clamor to take the course.

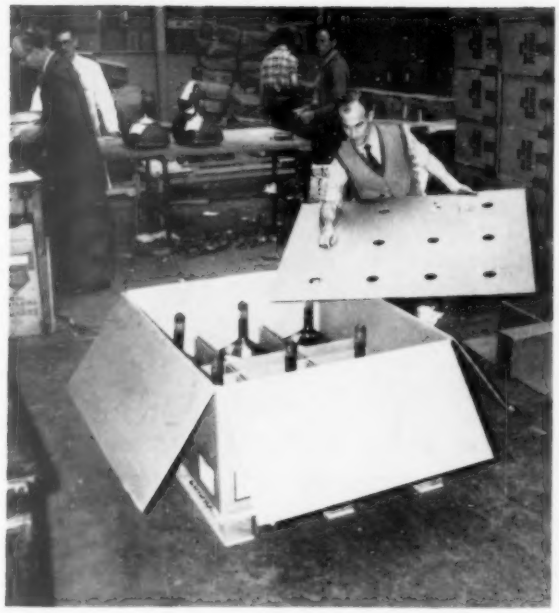
Rubber Stretches Ink-Pad Life

Who'd ever think of improving an ink pad? Well, someone did at Ryan Aeronautical Company's San Diego plant. Puts an end to a messy situation, saves money to boot.

Here's what happened: When Ryan used regular fabric ink pads for stamping part numbers on detail parts, pads became gummy in short order—had to be scraped, or cleaned and re-inked. This happened every two hours. And within three days each pad was useless.

Enter the man with an idea. If fine-ground sponge rubber absorbs moisture in a hat band, why wouldn't it make a good inking medium? Answer: It would—and does. Now Ryan's pads (made of the sponge rubber) don't get gummy and hold ink all day long. In addition, they hold their shape and deliver clearer and darker ink to the rubber stamp. Best of all, the new pads cost less than the fabric ones.

Reprints of the Plant Operating Case Book are available. Price 50¢. For quantity prices write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.



MULTI-PACK CARTONS SAVE PACKAGING TIME AND SPACE

Face down in bottom layer (left). Face up in top. That's how a British firm packages clumsy TV tubes efficiently. The method, using a multi-pack carton, saves labor and storage space for Siemens Edison Swan Ltd., Sunderland.

Cartons are versatile, too. They accommodate three tube sizes packed in double layers (six 21-in., twelve 17-in., or fifteen 14-in.). With bottom layer in place, operator inserts cardboard interleaf, then places tubes face upwards on second layer. Before packing in cartons, interleaf inserts are used to stack completed tubes. Only three men perform entire packaging operation, where formerly seven were needed. With the old method, tubes were packed individually. Now two sealed cartons are loaded on each pallet for four-high stacking with a fork-lift truck. Siemens has also simplified loading of trailer trucks. Sides open for carton loading while rear of truck remains closed. Canvas awnings protect load in transport.

Box-Opening Costs Now Cut 78%

It's no trouble to open a box at Tinker Air Force Base (Oklahoma City). Takes only a few seconds with an electric saw. Method saves 78% in time and labor for Air Material workers. And boxes are re-usable.

Mounted horizontally (photo), saw cuts lid free as box rides on a roller conveyor. With its reverse rake, saw blade can cut both wood and metal. Saw can also be mounted vertically. Base officers figure it now costs about 56¢ to open a box compared with $2.56 manually.

Ultrasonics Join Aluminum Foil

Ultrasonic sound waves automatically "weld" ends of aluminum foil rolls together at Aluminum Company of America (Pittsburgh). And the operation takes place while the foil moves through mills at regular speeds. This technique for producing continuous lengths is a joint development of Alcoa and Aeroprojects, Inc. (West Chester, Pa.).

Joining takes place when two pieces of foil are subjected to high-frequency vibrations of 50,000 cps. The vibratory energy fractures the natural oxide film on the foil but produces no spark, sputter, or melting. Metal then flows together to form a true metallurgical bond less than 3/32 of an inch wide. The bond thus formed is essentially as strong as the parent metal.

One company now using new long-length foil estimates saving up to $100,000 annually through reduced handling and scrap. Before ultrasonic splicing, firms using laminate and print foil slowed down or stopped equipment, then removed wide, heavy splice areas produced by heat-sealed adhesives. This new technique has been in the research and development stage since 1956.

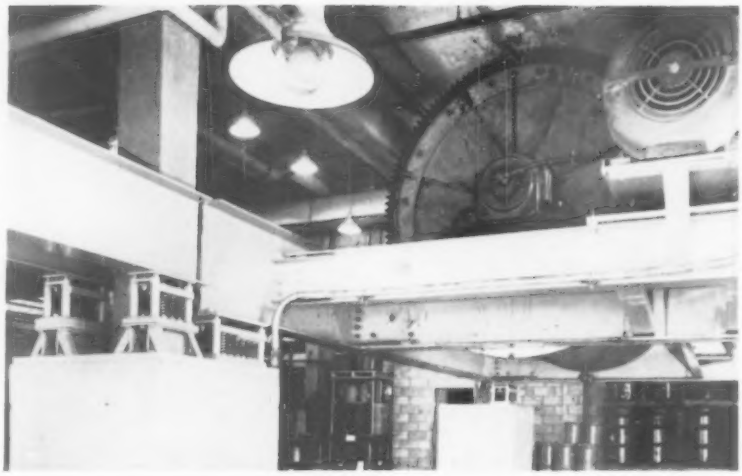
Filmstrip Gives Quality Check

Visual inspectors have prototypes of standard samples at their fingertips all the time at plants of Timken Roller Bearing Company (Canton, Ohio). They do it with three-dimen-

sional viewers and filmstrips of component parts.

Samples of bearings, cups, cones, cages, and rollers are selected for maximum defects, then photographed. Positive transparencies, stripped into a continuous roll, are distributed with viewers to all five of the company's bearing plants. Here inspector trainees study the filmstrips, while trained inspectors review them monthly.

With this film method new inspectors at Timken see all possible defects during the two-week training period. Under the old system trainees used to see actual part samples. But rust, discoloration, and loss created a constant replacement problem. Now one set of filmstrips lasts indefinitely.



SPRING MOUNTING CUTS VIBRATION

A vibration problem caused by the operation of heavy grinding mills was solved in an unusual way at the new ink plant of Sinclair and Valentine Company, Secaucus, N. J. The engineers (Abbot, Merkt & Company) spring-mounted the rigid steel frames suspending the mills above floor level. Used the same concrete piers that support roof and mezzanine structural members as a base. Thus needed fewer concrete piers to construct the plant on its soft, marshy site. Mills are located under a mezzanine in a 25-ft.-high bay area, are supplied through openings in floor.

Cuts Drum Handling 40%

Four vacuum pads, mounted on forks of a lift truck, make handling four 1000-lb. fiber or steel drums easy. This method replaces manual handling at Monsanto Chemical's plastics division plant, is expected to cut labor costs 40% for loading over-the-road carriers.

The specially designed vacuum-truck combination costs about 50% more than a conventional truck. But the company expects the vehicle to pay for itself in one year under normal operating conditions. To pick up load, operator positions 10-in. pads on tops of drums, then activates hydraulically driven vacuum pump. Drum tops must be flat, large enough for pad to fit, and made of material sufficiently non-porous to sustain a vacuum. They must also be free of debris. But grease or small particles do not interfere with pads' functions. Lifting capacity of the truck can be increased by installing larger pads.

Monsanto's new carrier resulted from the cooperation of two materials handling equipment suppliers. Truck with attachments and equipment came from Hyster Company; vacuum and mechanical equipment came from Vac-U-Lift Company, working with Monsanto engineers.

Source: E. Warren Geigel, Supervising Engineer, Manufacturing Services Dept., Monsanto Chemical Company, Springfield, Mass.

Middle Managers Do the Training

Two motives are behind the latest training scheme at Kearfott Company, Inc. First, the company wants training to be a line responsibility as well as a staff function. Second, it feels middle managers are most overlooked in training generally. And Kearfott doesn't want to join the ranks where management failed the "man in the middle."

Result is a 10-point plan for training. It spotlights the middle manager as designer, developer, and teacher. Here's how it works:

1. At the manufacturing manager's request, the plant's four superintendents developed a list of the most urgent training needs. Finally agreed on eight topics.

2. The manufacturing manager audited the list, came to agreement on topics with superintendents.

3. Next the manufacturing manager assigned two topics to each of the four superintendents.

4. The superintendents agreed on a schedule of sessions for foremen. Then developed their own presentations (with the counsel of the training department). To do this, they were required to study each subject, become an authority on it.

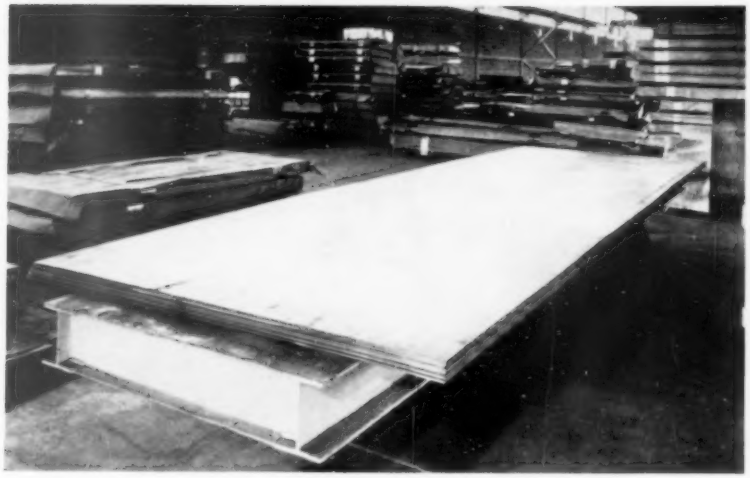
5. The superintendents polished each presentation in meetings with the plant training director.

6. The manufacturing manager acted as a sounding board to review the material for presentation.

7. Each superintendent gave his presentation a dry run in the presence of the other three men and the manufacturing manager.

8. Finally the superintendents put on their programs for the foremen. Every presentation started by outlining policy, then gave the foremen some practical know-how.

9. Line supervisors were encouraged (and aided by the training department) to review the text of



PLATFORM WEIGHS LONG STEEL SHEETS

Here's a smart method for weighing 30-ft.-long steel sheets accurately, without damaging them. Rolled Steel Corporation uses it at its Skokie, Ill., plant. Weighing is done with a 6x20-ft. permanent iron platform installed over a 4x8-ft. pit-mounted scale. After sheets are lowered onto scale by overhead crane, the cantilevered platform holds them level, thus prevents ends from dropping to floor and centers from bending. This eliminates need for any temporary blocking. Outgoing orders are weighed, then wrapped for shipping while still on scale.

every talk. This was aimed at developing feedback questions.

10. Separate sessions were set up for the superintendents to answer the feedback questions.

Source: A. E. Petitt, Training Director, Kearfott Company, Inc., Little Falls, N. J.

Detects Breaks In Glass Lining

This man isn't wire-brushing the huge glass-lined vessel. He's testing the lining for continuity. The nondestructive testing device, called Pfaudlertron, was developed by The Pfaudler Company, Rochester.

The constant-voltage electronic tester is specifically engineered for field-testing glassed-steel equipment. The photo "brush probe" with a 5-in.-wide inspection path is being used here. A pointed probe can also be used.

Each individual wire of the brush can indicate exposed metal. The unit has a stabilized output of 3500 volts a-c and will indicate contact with as much as ⅛-in. gap between probe point and vessel surface. If contact is made a neon light in the lucite handle glows brightly.

Committee Fights Handling Errors

Any egg farmer knows you have to handle a delicate product carefully. So says the chairman of the newest committee at Daystrom Instrument Division of Daystrom, Inc. (Archbald, Pa.). The committee is charged with in-plant materials handling. It's made up of four men representing manufacturing engineering, production control, and production management. The chairman is an inspection supervisor.

The committee is charged with:

1. Providing and maintaining good handling equipment.

2. Devising better methods of handling.

3. Educating employees on the methods to speed work, cut rejects.

In the first few weeks of operation the committee started three new programs. It set up a central area for storage, repair, and maintenance of handling equipment. Then it started a complete plant review of handling methods and submitted suggestions for improvements. Finally it launched a materials handling educational program based on techniques used in other plants.

Easy-to-Spot Safety Equipment

Cold strip mill No. 3 at Inland Steel Corporation (East Chicago, Ind.) boasts 15 safety islands like the one above. Located strategically throughout the mill, they're big and bright enough to stand out in even the worst disaster. This eliminates the chance a panic-stricken worker won't be able to find an extinguisher or any of the other 13 emergency items at each island.

Each island stands 9 feet high, 12 feet wide, is built to hold more than 14 emergency items. Items include a regulation stretcher in a fiber glass canister, an inhalator, two Chemox oxygen breathing units, a wire basket stretcher, and a first-aid kit. Also mounted on the panel are three types of fire extinguishers, a blanket in a new type of sealed box, safety cables, wedges, a sledgehammer, and a lifting bar.

Island is illuminated with fluorescents. Has a safety bulletin board (large numbers indicate nearest emergency station) and a list of emergency phone numbers—police, fire, medical, safety departments.

5 Times More Light—Same Price

It doesn't make sense to stop at the inside factory wall when you're improving plant lighting. That conviction led to the near daylight-like appearance outside Convair's San Diego assembly plant. First, engineers upgraded high-bay lighting inside the plant from 10 to 72 foot-candles (FACTORY, March 1958, page 115). Then they turned to obsolete security lighting around the perimeter of the plant.

Their success with power tube fluorescents indoors left no question that this was the outdoor light source to use. Original outdoor lighting installed during World War II served primarily as a minimum security measure. Installation consisted of 750-watt incandescent lamps (204 in all) in reflectors. These were mounted on the perimeters of the buildings, 35 feet above ground level. Resulting intensity averaged roughly one to two foot-candles at 48 inches above grade level.

Before modernizing the outdoor lighting system Convair engineers established three prerequisites. There must be a minimum of outlets and rewiring. Fixtures had to be easy to service and relamp. And light distribution had to be uniform.

Because this was a pioneer installation, Convair put in test fixtures at various points in the yard area. Test mounts allowed adjustment of the fixture angle all the way from horizontal to vertical position. During the several months' tests, lighting was evaluated at all mounting angles. Results showed that at a fixture elevation of 35 feet the best angle was 15 degrees from the horizontal. At 20 feet up, the best angle was 30 degrees.

After determining proper mounting angles, engineers plotted intensity in the lighted test area with a light meter. Then they applied these results to a drawing of the yard areas. Found 178 lighting fixtures would provide the desired results. Of these, 94 were two-fixture units and 84 single-fixture units, with each fixture having two 96-in. power tube lamps. Average installation cost was $218 per outlet.

Results of the installation are gratifying. They exceed minimum requirements for security lighting by a comfortable margin. At the same time, operating cost per foot-candle-hour is only 13% of the old system's. And total power usage is down in spite of a five- to six-fold increase in light levels. In addition, annual relamping costs are about a fifth that of the old system, shadows have been cut, and over-all eye comfort is much better. The 8- to 10-foot-candle intensity has made valuable outdoor working space useful around the clock.

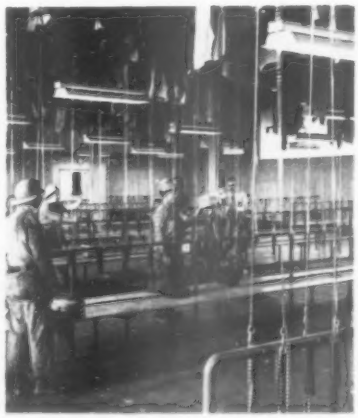
Source: W. E. Brautigam and L. G. Lamp, Plant Engineering, Convair Division, General Dynamics Corporation, San Diego, Calif.

YOU BE THE ARBITRATOR

Continued from page 148

The award—In studying the Class B inspector job description, the arbitrator found no reference to schematic or blueprint reading. Under the circumstances, he said, the two men were substantially equal in ability for Class B work. Thus the promotion went to the senior man. He acknowledged there was logic to the company's desire to promote a man who would be more likely to advance. But that was a matter for negotiation, not arbitration. There was nothing in the contract to permit management to consider anything except qualifications of the applicants for the immediate opening.

Caution: The award in this case is not an indication of how other arbitrators might rule in other apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.



High-Level Lockers

It's shift-change time at Bethlehem Steel Company's (Bethlehem, Pa.) Grace Mine. Workers head for a change room like the one above. Their street clothes are right there, but not in the way. They're held high on chains by means of a pulley attached to the ceiling.

Then after the men get out of their work duds, clean up, and get their street clothes on, they hoist the work clothes up. Leave them there until next day.

American
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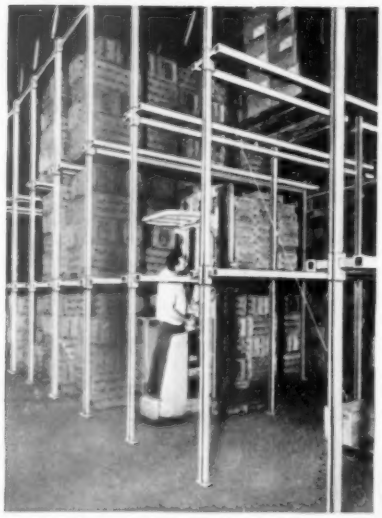
Drive-In or Drive-Thru
ADJUSTABLE RACKS



Any fork truck can drive directly into storage area to load or unload, the American way.

Sturdy, load-carrying stringers are made of rugged square tubing from one end of a row to the other.

Cut storage labor cost–get more storage space for your dollar

You can "write off" your storage problem as solved when you install American "Drive-In" or "Drive-Thru" Racks. They provide mass cube storage with a minimum of aisle space, plus the speediest, most efficient load-handling available today. American "Drive-Thru" Racks are open at both ends so trucks can travel all the way through for "first-in, first-out" storage. American "Drive-In" Racks can be used against wall for maximum space-saving, or can be spaced from wall for truck entrance from either end. American trigger-quick, slide-n-lock stringers make height adjustments, on 4" centers, a simple matter. Get all the facts about these rugged, adjustable, Open-End Racks that make non-productive aisle space productive storage space!

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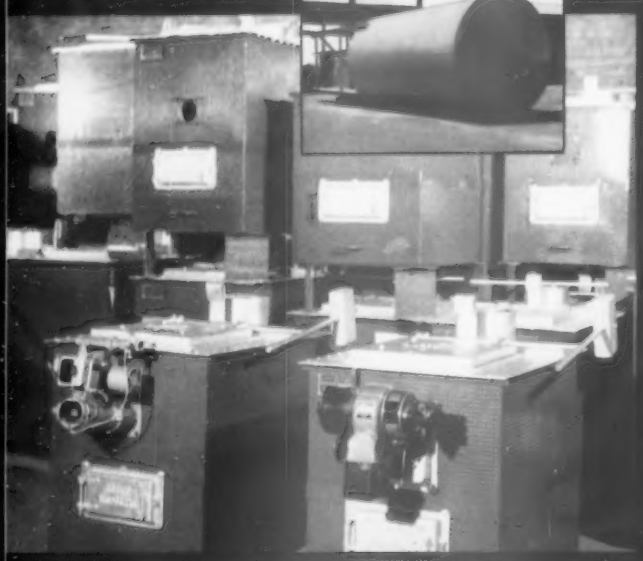
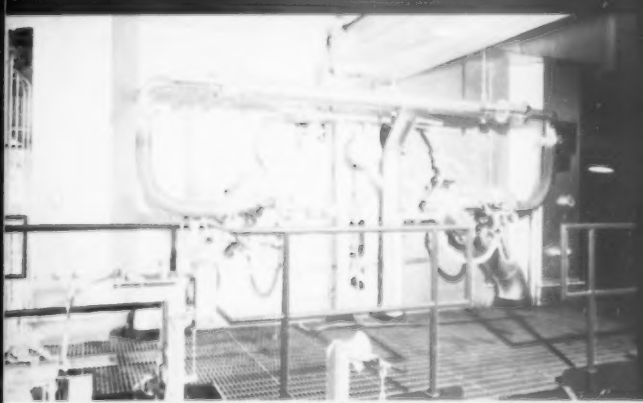
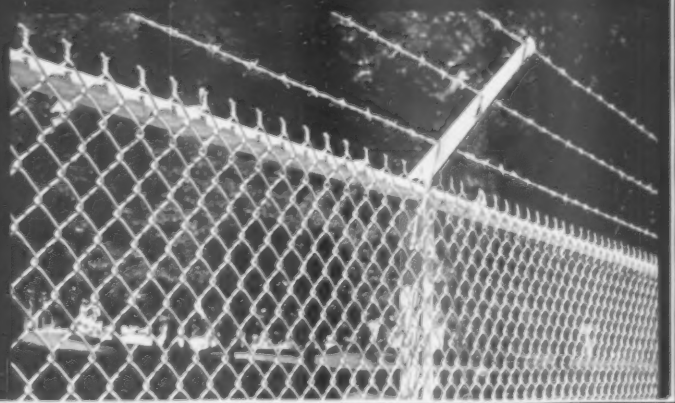
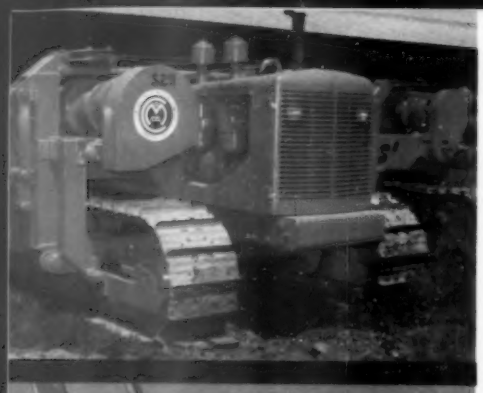
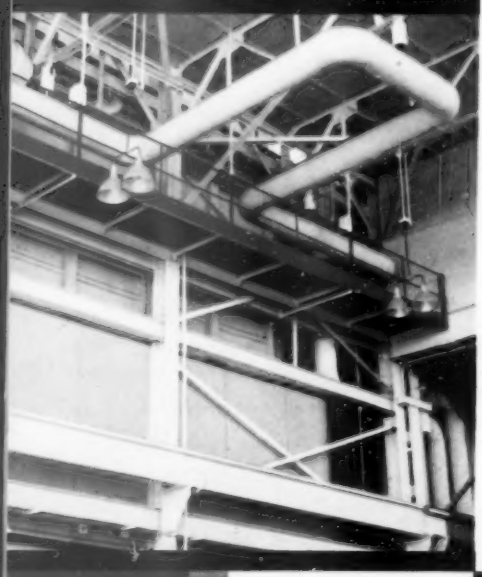










...another important **Difference** in the Rust-Oleum System

How many coating manufacturers offer you a *complete system* that Stops Rust—and provides lasting beauty over the years? The Rust-Oleum *System* does just that.

First—apply Rust-Oleum 769 Damp-Proof Red Primer directly over the sound rusted surface, after scraping and wirebrushing to remove rust scale and loose rust. The *specially-processed* fish oil vehicle in the primer penetrates rust to bare metal—merging the rust into the coating—saving costly surface preparations. *Second*—the wide variety of colors in Rust-Oleum finish coatings provides lasting beauty over the primer. Your choice of practically all colors from bright enamels to soft, restful pastels—all formulated for long over-the-years protection.

What is your coating problem? From Heat Resistant, Chemical Resistant, and Machinery Finishes to Heavy-Duty Top Coatings for use indoors and out—Rust-Oleum has the coating to meet your needs and the *system* for lasting beauty. Consult your Rust-Oleum Industrial Distributor . . . he has complete stocks for your use in maintenance, new construction, and remodeling. His experience can serve you well.

A matter of excellence.
Distinctive as your own fingerprint.

RUST-OLEUM®

STOPS RUST!®

RUST-OLEUM IS AVAILABLE IN PRACTICALLY ALL COLORS

SEE OUR CATALOG IN SWEET'S
OR WRITE FOR COPY

STOP RUST

with
RUST-OLEUM
769 Damp-Proof Red Primer

Eliminate costly surface preparations and save time, money, and metal. Just brush Rust-Oleum 769 Damp-Proof Red Primer right over the sound rusted surface—after scraping and wirebrushing to remove rust scale and loose rust. You can do this because the **specially processed fish oil vehicle** penetrates rust to bare metal—as proved by radioactive tracing studies.

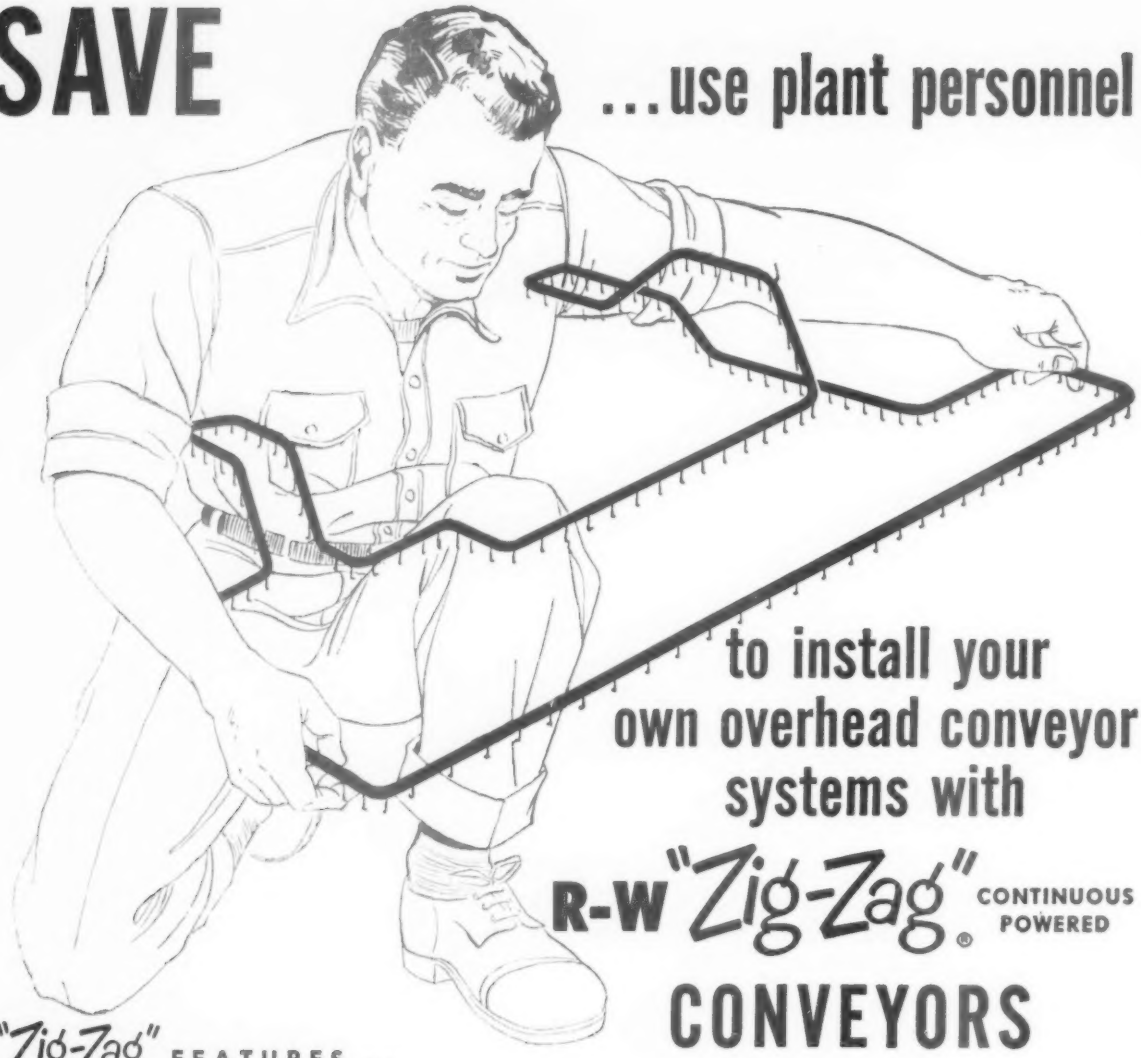
SEND FOR FREE TEST SAMPLE! ATTACH TO YOUR LETTERHEAD!

Rust-Oleum Corporation
2982 Oakton Street, Evanston, Illinois

Please send me the following at no cost or obligation:

- ☐ Free test sample of Rust-Oleum 769 Damp-Proof Red Primer for rusted metal surfaces.
- ☐ Complete literature with applications and color charts.
- ☐ Information on matching special colors.
- ☐ Thirty-page report on Rust-Oleum fish oil penetration.

SAVE ...use plant personnel



to install your own overhead conveyor systems with R-W "Zig-Zag"® CONTINUOUS POWERED CONVEYORS

"Zig-Zag" FEATURES...

- **FLEXIBLE**... easily moves up, down, in, out and around... will carry unit loads up to 125 lbs. at speeds from one inch to 100 feet per minute. Easily installed in any plant.
- **SAFE**... all moving parts of the chain are fully enclosed and protected from dirt, dust, etc.
- **STRONG**... a continuous chain of alternate horizontal and vertical wheel units travel through a rugged steel track.
- **EFFICIENT**... designed, manufactured and backed by the leading firm in this field for over 75 years... Richards-Wilcox.

R-W also manufactures other top-quality overhead conveyor systems to meet the rugged demands of industrial and commercial use. This line includes:

- R-W "TWIN-TRAK" OVERHEAD AUTOMATIC DISPATCH SYSTEMS... CATALOG NO. F-192.
- R-W "TRU-TRED" MONORAIL CONVEYORS... CATALOG NO. A-64.
- R-W "SAFE-RAIL" CONVEYOR EQUIPMENT... CATALOG NO. A-94-R.

It is easy to do... in fact it is much like "building with blocks". You merely take so many standard R-W "Zig-Zag" conveyor components and put them together into a *custom* conveyor system to meet your exact requirements. *It is economical*—for you can use your own plant personnel to "self-assemble" and install an R-W "Zig-Zag" Conveyor. If you need assistance, there is an R-W Sales-Engineer near by to serve you. Expansion can easily be accomplished at a later date... again by using standard "Zig-Zag" components and your plant personnel to "add on" to the original system. SAVE with R-W "Zig-Zag" Conveyors... they are economical to purchase... economical to install... and economical to maintain. Ideal for small or very large installations. Naturally we will engineer and install a "Zig-Zag" system if you so desire. Write today... request Catalog No. A-93R.

R-W

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Tuffy Tips —on safe use of Slings and Hoist Lines

Safety Council Cites Factors In Lifting Injuries

The National Safety Council points out that nearly a fourth of all compensation cases are the result of unsafe handling methods or conditions, and lists the following as factors contributing to handling injuries:

"(a) Handling loads that are too heavy; (b) lifting or lowering with the back muscles instead of the leg muscles; (c) handling load with an insecure grip and failing to watch where hands are placed; (d) handling without sufficient help or failing to use mechanical equipment; (e) handling before getting a firm footing; (f) lifting or lowering with a jerking, twisting movement of the body, or when the body is in an awkward position."

Maintenance Tips for Hoisting Equipment

(1) Be sure crane and hoist controls are in proper working order. Don't use equipment that hasn't been tested recently.

(2) Inspect hitching equipment before it is used. Recheck after use.

(3) Remove hitching equipment not in use from hooks, hoists and loads. Don't allow it to remain loose.

(4) Store slings systematically when they're not in use. Don't let them lie around helter-skelter. They may be damaged between lifts.

Proper Sling Fittings Assure Greatest Safety and Efficiency

Fittings used on Tuffy Slings are of the most improved types and are factory-fitted on the Tuffy Sling you order. Or, if you prefer, you can fit them in your rigging loft. Shown here are two of these Tuffy Sling fittings.

Newco Gripper Sling Hook:

Fitted with a spring that bears against the sling. This holds slide hook at any position on sling, thus preventing it from sliding down to the sling eye each time it is unhitched. Easily positioned for each new load. Hook readily chokes into position when load is applied.

Sliding Hook

The smoothly rounded saddle slides on the sling leg with minimum wear to tighten on the load. Made of extraordinarily tough manganese steel to afford an ample factor of safety on rated loads. Designed with steel distributed in relation to stress lines.

Tuffy Hoist Line: Perfect Team Mate for Tuffy Slings

Tuffy Hoist Line is a special rope construction for use on all types of overhead cranes, derricks and clamshells. It has the right combination of strength, flexibility and toughness for greatest safety and longest life in its wide range of uses.

See Your Tuffy Distributor for the Most in Sling and Wire Rope Service

Ferrule Safety is a Part of Sling Safety

The steel ferrule is applied under tremendous pressure. It holds so tight that the eye splice has 100% of fabric strength. It's smoothly tapered to meet the main body of the sling. No abrupt edges or sharp projections. The extra quality and safety of Tuffy's pressed-on ferrule is yours at no extra cost.

Tuffy Braided Wire Fabric: Successor to Wire Rope in Slings

The secret of the extra strength and greater flexibility of Tuffy Slings is also the secret of their greater safety. It's the exclusive, patented, machine-braided fabric. You won't find it in any other sling. It means longer sling life, easier handling and greater ability to take deadloads, shocks and impact with safety.

Kinks Can't Hurt a Tuffy Sling

One of the first rules of ordinary wire rope safety: never use a sling that has been kinked. The wires are permanently bent, damaged and weakened. Not so with Tuffy Slings. Tuffy's patented, 9-part machine-braided fabric is just about impossible to kink. And if it does, under some unusual condition, you can straighten out the kink with ease—leaving no material damage.

FREE! New Tuffy Sling Handbook

Revised and enlarged edition. Covers slings from A to Z. Gives types, dimensions, weights, rated loads, proper fittings. Even includes safety-approved standard signals used in operation of various equipment. Send for your free copy now. Address **Union Wire Rope Corporation, 2234 Manchester Ave., Kansas City 26, Mo.** Specialists in high-carbon wire, wire rope, braided wire fabric and stress relieved wire and strand.

UNION Wire Rope

S-3

Subsidiary of ARMCO STEEL CORPORATION

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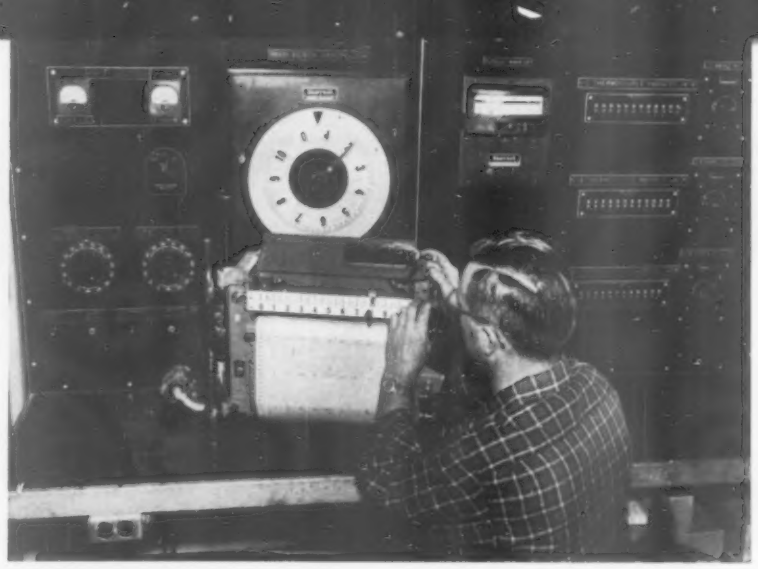
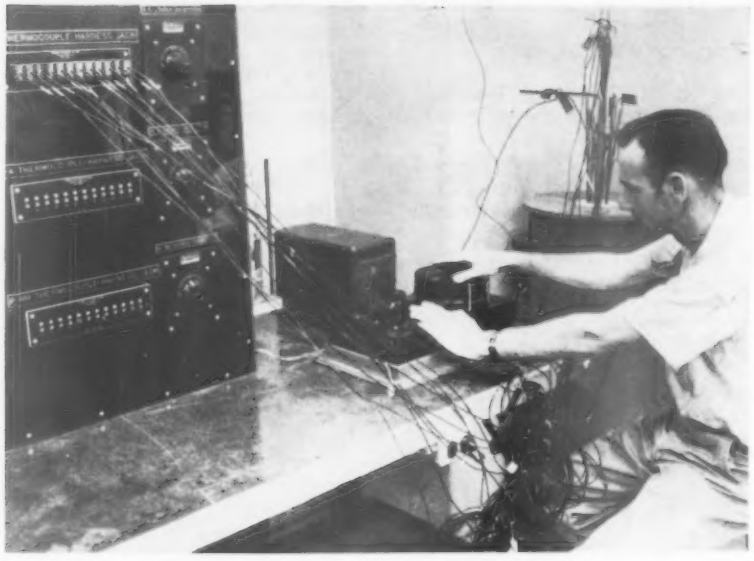
New steels are born at Armco

AT THE BENCH . . .

. . . Lockheed instrument maintenance man faces multi-purpose test facility that tells facts on instruments of many different types and makes. Removable mounting post gives easy access to both sides of instrument.



. . . Electrically operated, manually or automatically controlled calibration furnace and built-in ice baths make it easy to plug in and calibrate as many as 12 thermocouple assemblies at one time.



Newest Way to Cut the Cost of

And get far more precision into the bargain. This Lockheed plan will give you reliability, portability, economy. And no shutdown of production.

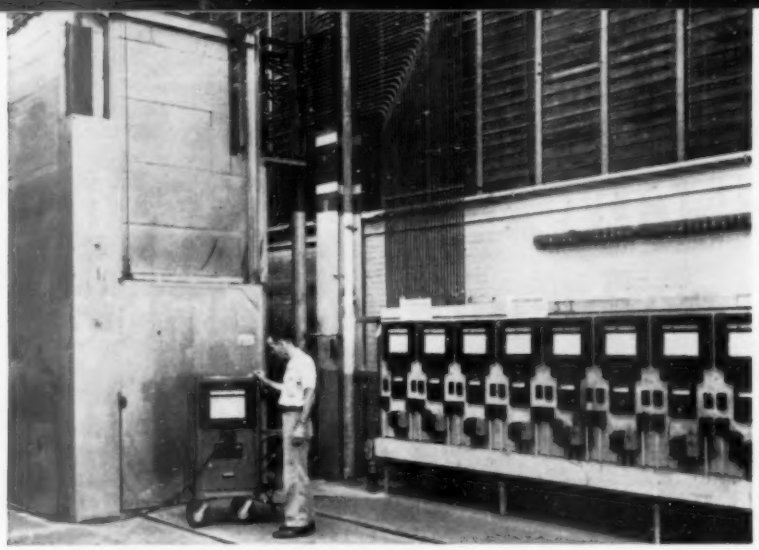
A LONG, HARD LOOK. That's what our people recently gave furnace-control instrument maintenance methods here at Lockheed's Georgia Division.

Our findings: Acceptable control-maintenance methods were obsolete —and expensive. Our action: A master plan that changed the concept of heat-treat instrument maintenance, saves $8450 per year in labor alone, will pay for itself in less than a year and a half.

Features of this master plan are the following:

- A new quick-disconnect system to facilitate replacement of control instruments during maintenance.
- No interruption of production when control equipment is being tested or repaired.
- Quick, easy precision testing.
- New facilities (test bench, carts, spare instruments) and rewiring (photos above) at a cost of only $12,150, including labor.
- Assurance of optimum operation of production equipment.
- Revised written procedures for instrument technicians.
- Efficient schedules for mainte-

By R. G. LADY, Instruments Engineer, and R. G. MATTHEWS, Plant Electrical Engineer, Lockheed Aircraft Corporation, Marietta, Ga.



ON THE FLOOR . . .

. . . Lockheed technician can make accurate, permanent record of heat distribution inside any furnace, salt bath, or heat-treating device. This way, critical temperatures are maintained around the clock.

. . . Test cart provides precision on wheels. Built-in constant temperature ice bath eliminates need for figuring ambient temperature correction for the cart's reference thermocouple. Lockheed built cart.

Your Instrument Maintenance

nance, using available IBM punched-card equipment.

• Continuation of the unbroken chain of measurement back to test equipment certified by the National Bureau of Standards.

WHAT OUR STUDY SHOWED

Our Georgia Division makes airplanes. Uses 27 heat-treat furnaces plus 10 other pieces of heat-treat equipment scattered over a wide area. Has 58 recorder-controller instruments of various types to supervise temperature control.

Our study showed up the weaknesses of our system. When a controller needed repair we took test equipment to the instrument, adjusted and cleaned it right in the shop. Made no difference whether the shutdown was routine or emergency. Either way, we had to shut down the furnace, reshuffle production work.

We had to do repair work under pressure on the floor. Precision equipment was exposed to fumes and contaminants. Hours of technicians' time were being spent in calculations because we had no portable direct-reading calibration equipment. Calibration of thermocouples was slow and inefficient. Juggling was needed to keep maintenance from interfering with production. Costs totaled about $228 per year per instrument.

ACTION ON EQUIPMENT

Our biggest stumbling block: practically no standardization of control equipment. Although the majority of the controllers were Minneapolis-Honeywell (Brown Series 15) units of different types, Wheelco, Leeds & Northrup, and other makes of equipment were used in various places in the plant.

Turn the page

General Electric announces the most efficient and economical 40-watt fluorescent you can buy

THE PREMIUM 3

3100 lumens

(Same preferred cool white as before)

Get 17% more light from your present fixtures!

G-E PREMIUM 3 Lamps give you the lowest over-all cost of light of any 40-watt lamp. Three new innovations provide added light worth more than the cost of the lamps themselves: 1) more efficient phosphors, 2) newly designed electrode mount, 3) new current-carrying gas mixture.

G-E PREMIUM 3 Lamps are the latest example of General Electric's lamp development to give you more for all your lighting dollars. G-E *Premium* 3 Lamps operate on Rapid Start or Pre-heat (starter-type) circuits—and will be widely used to make existing systems deliver more light, at virtually no added cost. Available in limited quantity in May, list price $1.45.

On Rapid Start circuits G-E *Premium* 3 Lamps have a 7,500 hour rated life; 5,000 hours on Pre-heat circuits. Write for the whole story on this new dimension in fluorescent lighting. General Electric Co., Large Lamp Dept. C-926, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

G-E PREMIUM 3

now joins these other outstanding "firsts" in fluorescent lighting . . . all introduced by General Electric!

1938—FIRST FLUORESCENT. This was the year General Electric announced the first practical fluorescent—a revolutionary new and efficient lighting tool.

1939—FIRST 40-WATT. Predecessor to today's highly efficient 40-watt fluorescents—opening the way for the new G-E *Premium 3* Lamp.

1946—FIRST SLIMLINE. This single pin lamp, the first practical 8′ tube, provided more attractive lighting systems, quicker lamp changing, instant starting.

1952—FIRST RAPID START. This G-E development brought faster, flickerless starting *without starters*—and cut maintenance costs, too.

1954—FIRST HIGH OUTPUT. Delivered half again as much light as slimlines, more light from equal fixtures, for big investment savings.

1956—FIRST POWER GROOVE. This revolutionary, grooved lamp gave 2½ times the light of slimlines; saved 5-20% on initial investment.

1959—NEW POWER GROOVE. The most powerful fluorescent you can buy. Double row of grooves helps increase light output 12%, to 15,000 lumens for 8-foot length.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Begins on page 160

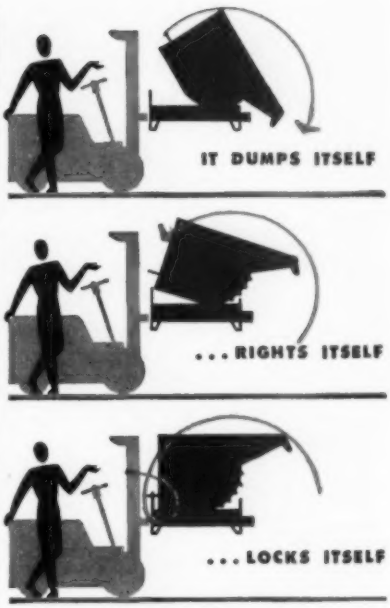
A study of all instruments showed that just 12 different wiring plans could cover all the equipment we were using. So we had to design bench-test equipment that would handle these different makes and models. We didn't have a plug-in or terminal board layout that could be used as a common standard.

So, as one of the first steps in the changeover, we rewired all Brown Series 15 instrument terminal boards for plug-in connection (within their cases) with a 40-contact Cannon plug. Since the other makes and models of instruments were not as complex, we disconnect them from their original terminal boards. Now we can unplug (or disconnect) any controller to be overhauled, quickly remove it from its case, and mount and plug in a spare duplicate unit in its place. This changes a time-consuming project to a job taking only a few minutes. And furnace production is not interrupted.

ACTION IN THE LAB

The best way to test a control instrument is to test it as part of a functioning temperature-control system. Our new test bench is designed to provide this check on any make or type of control instrument, amplifier, electro-pulse unit, or other component. Adjacent to the test bench we now have an electrically operated thermocouple calibration furnace and thermos-bottle ice baths. Built into the bench is a complete Brown Series 15 temperature controller system with Cannon plugs adapted to all controllers and components in the plant.

On the face of the bench panel are matching 40-prong sockets for the Series 15 instruments and jack connections for other types of instruments. Into these we can plug either the built-in controller or any instrument brought in for test. Most of the contacts in the 40-pin socket are used for connections to power supply, thermocouples, control circuits, etc. But seven of the pins are used to energize stepping relays that rewire the bench circuitry to take care of circuit differences between different types of Series 15 instruments. The stepping relays are



This hopper and your truck can cut handling costs 50%

It's a self-dumping hopper made for fast, efficient handling of wet or dry, hot or cold bulk materials, such as:

Scrap Metal . . . Cinders
Cullet . . . Hot Forgings
Punch Press Parts
Soybean Meal . . . Pickles

Hundreds of industries use thousands of them. Pick-up is swift and simple. Forks or platform of any standard lift truck slide easily into hopper underframe. Truck operator picks up loaded hopper . . . transports it to its destination . . . trips the latch . . . and the Roura does the rest . . . automatically.

They're strong . . . husky . . . made of 3/16″ steel plate with continuous arc-welded seams. Also available in stainless steel or galvanized. Made in five sizes, ½ to 2 yard capacities, with live skids or a choice of wheels.

Standard models are available for immediate shipment from stock.

ROURA *Self-Dumping* HOPPER

WANT MORE DETAILS on how you can save money with Roura? Just clip this coupon . . . attach it to your letterhead . . . sign your name . . . and mail to

ROURA IRON WORKS, INC.
1423 Woodland Ave., Detroit 11, Michigan

mounted behind the panel and readily accessible for checking or change. Various jumpers across the seven pins determine whether the iron-constantan or chromel-alumel temperature compensator is used. Spare pins in the socket are available for any changes in controller circuitry on new types of instruments.

The instrument technician can plug in any controller suspected of malfunctioning and give it a complete functional test in the laboratory. The instrument can be either controlled by a built-in millivolt supply or connected to a thermocouple in the laboratory furnace. This thermocouple calibration furnace can be controlled from the test bench or by the instrument being tested.

ACTION ON THE FLOOR

Quick substitution and overhaul of instruments is only half of the over-all job of setting up a comprehensive instrument maintenance program. The constant job of checking the accuracy of instruments in service has to be done precisely and with a minimum of time.

Two custom-made portable uniformity survey carts take much of the precision of the laboratory right to the production floor.

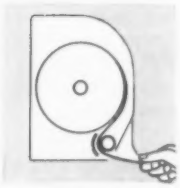
We built the carts around two Brown Series 15 recorders already on hand. We modified these instruments to function as 12-point recorders, with a full-scale response of 5 millivolts. With two carts, we can use one while the other is being maintained or calibrated.

The recorders have plug-in-type range-changing cards to give center-scale values of 250, 350, 375, 650, 920, and 1600 F., corresponding to checking temperatures for the plant's various heat-treat devices. We can make additional cards at any time for other center-scale values. Cold-reference junction ice baths are built into the carts to eliminate ambient temperature compensation. Tolerances calculated in millivolts can be read from the instrument chart directly, eliminating all mathematical calculations.

When a furnace is due for a routine check we roll the cart up to

Steiner controlled towel dispensers

Cut washroom costs three ways



HOW IT WORKS: Towels are in roll. User pulls towel down and tears up. Control mechanism turns roll so another towel is ready for next user. Result: every user gets enough towels but there is no waste.

First: You'll save with Steiner Company controlled paper towel dispensers because *controlled* dispensing cuts towel waste . . . as much as 20 per cent. Second: You'll reduce washroom maintenance costs because cabinet holds about 500 towels . . . coupled with waste cutting, this means supply lasts longer and cabinet has to be refilled less frequently. Third: You can reduce your inventory and free valuable storage space for other supplies. Reason: A case of Steiner roll towels is the same size as a case of folded . . . yet it holds twice as many towels.

Your local janitorial supplier or sanitary paper distributor can help you . . . there is no charge for the dispensers. For free literature please write to Steiner Company, 740 Rush St., Chicago 11, Ill.

STEINER

STEINER COMPANY

740 RUSH STREET, Dept. B-6 CHICAGO 11, ILLINOIS

For more facts Circle 528 on Reader Service Card

This month's news from Raytheon . . .

Raytheon Distributors Offer Ignitrons, Thyratrons, Rectifiers

The [illegible] Distributor Products Division of Raytheon Company, [illegible], today announced the addition of three new industrial tube lines to the list of products they [illegible] industrial distributors. The new [illegible] thyratrons and gas and

RAYTHEON

Save Time and Money on Industrial Tubes

What this new Raytheon expansion means To Industrial Control Tube Users

WHATEVER YOUR NEEDS—Now your local Raytheon Industrial Tube Distributor can also give you 24-hour service on

IGNITRONS: From 600 to 1200 KVA; 56-140 amps peak current.

THYRATRONS: Argon, Xenon or Mercury. From 3-77 amps peak current; 1000-5000 peak inverse volts.

HALF-WAVE RECTIFIERS: Argon, Xenon or Mercury. From 10-77 amps peak current; 500-2000 peak inverse volts.

FULL-WAVE RECTIFIERS: Argon or Mercury. From 10-25.6 amps peak current.

PRICED RIGHT – Raytheon products are available through local distributors at no penalty in prices on small quantity requirements.

END "DOWN TIME"—Your welders, motor controls, DC power supplies, RF heating equipment never need to "down." Replacements are as near as your phone.

"How our Raytheon Distributors want to serve you."

by John Hickey,
Raytheon Industrial Products Manager

"Please ask your Raytheon Distributor to take inventory of the electronic tubes you use. We'll provide him with a complete back-up stock. He'll deliver tubes you need within 24 hours. Best of all, he can supply this service at no penalty in price. Of course, all tubes are new, with full Raytheon warranty. If the name of your nearest Raytheon Industrial Products Distributor is not listed in the adjacent column, drop me a line. I'll be happy to send it to you."

RAYTHEON

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Cleveland, Ohio
Pioneer Electronic Supply Corporation
Denver, Colo.
Ward Terry & Company
Detroit, Mich.
Ferguson Electronic Supply Company
Inglewood, Cal.
Newark Electric Company
Kansas City, Mo.
Burstein-Applebee Company
Los Angeles, Cal.
Kierulff Electronics Corporation
Milwaukee, Wis.
Electronic Expeditors, Inc.
Mobile, Ala.
Forbes Electronic Distributors, Inc.
New York City
Arrow Electronics, Inc.
H. L. Dalis, Inc.
Milo Electronics Corporation
Oakland, Cal.
Elmar Electronics
Philadelphia, Pa.
Almo Radio Company
Phoenix, Ariz.
Radio Specialties & Appliance Corporation
Portland, Ore.
Lou Johnson Company
Tampa, Fla.
Thurow Distributors
Washington, D. C.
Electronic Wholesalers, Inc.

This is a partial listing only. Names of other Raytheon Industrial Distributors on request to Raytheon Distributor Products Division, 55 Chapel St., Newton 58, Mass.

RAYTHEON COMPANY • DISTRIBUTOR PRODUCTS DIVISION

NEW

RAYMOND

HEAVY-DUTY TRUCK

Outperforms

many counterbalanced trucks

Performance never before possible!

24 Volt

Combining the operation of heavy counterbalanced trucks with narrow aisle trucks, the Raymond Heavy Duty outperforms many counterbalanced models and all narrow aisle equipment! Due to short length, combined steerable wheels and driving wheels, full 90° right angle turning and tiering is possible in aisles as narrow as 7½ feet. Result: more space for storage or production.

Two husky 24-volt motors power two large, steerable, all-gear drive wheels . . . produce positive power for long hauls, up ramps with full load, and for outdoor use . . . real power for rapid lift or lower. Four speeds forward or reverse. Two-wheel hydraulic brakes.

The RAYMOND CORPORATION
3290 Madison Street,
Greene, N. Y.
Send Heavy Duty Truck Bulletin

NAME TITLE
COMPANY
STREET
CITY STATE

Begins on page 160

the furnace, plug it into the nearest convenience outlet. When a furnace has more than 12 control points, we use both carts. Specially designed lightweight thermocouple probes are inserted in each probe hole in the furnace. Separate lead wires connect each probe to the jack panel on the front of the cart. The controller built into the cart is turned on and in 2½ minutes individual readings from each of 12 couples are automatically recorded on the instrument chart. This gives an accurate picture of heat distribution within the furnace. The technician merely has to glance at the chart to visually locate the upper and lower tolerance limits, and see if all readings fall within these points. The furnace can be used during the entire check.

Under the old method, the process control department had to negotiate with production for the required furnace downtime. One technician would insert the single test probe into each probe hole in the side or top of the furnace. Another technician, using an indicating potentiometer, would record the millivolt readings, each time compensating for variations in ambient temperature. Inevitably we lost a lot of time as the probe was moved from hole to hole. After we had taken all readings in millivolts we converted them to temperature mathematically and then recorded them by hand. This whole process required several hours for each furnace.

ACTION ON FOLLOW-UP

To make sure that a good plan will be followed up, our process control department sets up firm schedules for periodic overhaul and calibration of each heat-treat unit, issues clear-cut job instructions on each, and arranges for scheduling through the plant's IBM system.

When check-up is due, the technician receives a punched card for each furnace, showing the appropriate page number of our job instruction book. When he completes the work he signs the card, making notations of recommendations, troubles encountered, or parts used. After study, cards become part of the furnace history file. **END**

For more facts Circle 530 on Reader Service Card

For more facts Circle 531 on Reader Service Card ➤

ALLEN-BRADLEY
Solenoid Starters give

MORE MILLIONS OF TROUBLE FREE OPERATIONS

. . . and for good reasons

• ONE MOVING PART

With this simple solenoid design, there's virtually nothing to go wrong—all trouble-causing bearings, pivots, and flexible jumpers have been eliminated.

• DOUBLE BREAK, SILVER ALLOY CONTACTS

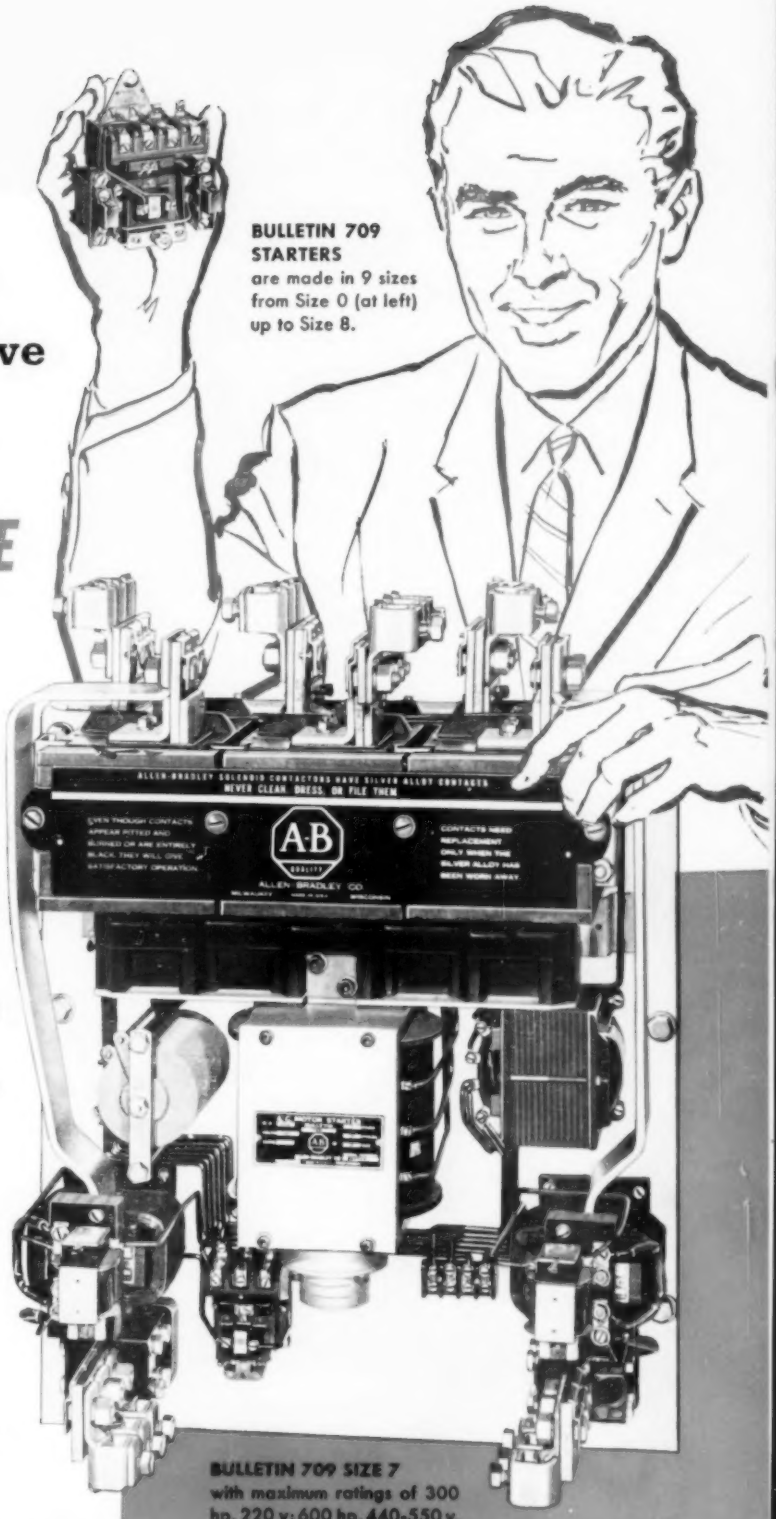
Allen-Bradley silver alloy contacts never require maintenance. They are always in perfect operating condition . . . and remain so until completely worn away.

• SIMPLE UP-AND-DOWN MOTION

The virtually frictionless, straight line vertical motion provides uniform contact pressure at all times—and assures consistent, rapid operation of the contactor.

• RELIABLE OVERLOAD PROTECTION

All A-B starters are equipped with two permanently accurate and reliable overload relays that protect motors against "burnouts." Three overload relays can be furnished.


ALLEN-BRADLEY SOLENOID CONTACTORS HAVE SILVER ALLOY CONTACTS
NEVER CLEAN, DRESS, OR FILE THEM
EVEN THOUGH CONTACTS APPEAR PITTED AND BURNED OR ARE ENTIRELY BLACK, THEY WILL GIVE SATISFACTORY OPERATION
A-B
ALLEN-BRADLEY CO.
CONTACTS NEED REPLACEMENT ONLY WHEN THE SILVER ALLOY HAS BEEN WORN AWAY

BULLETIN 709 STARTERS are made in 9 sizes from Size 0 (at left) up to Size 8.

BULLETIN 709 SIZE 7 with maximum ratings of 300 hp, 220 v; 600 hp, 440-550 v.

ALLEN-BRADLEY
MEMBER OF NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

QUALITY MOTOR CONTROL

4-59-MR

NEW

RAYMOND

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Outperforms

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Performance never before possible!

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3290 Madison Street,
Greene, N. Y.
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NAME TITLE
COMPANY
STREET
CITY STATE

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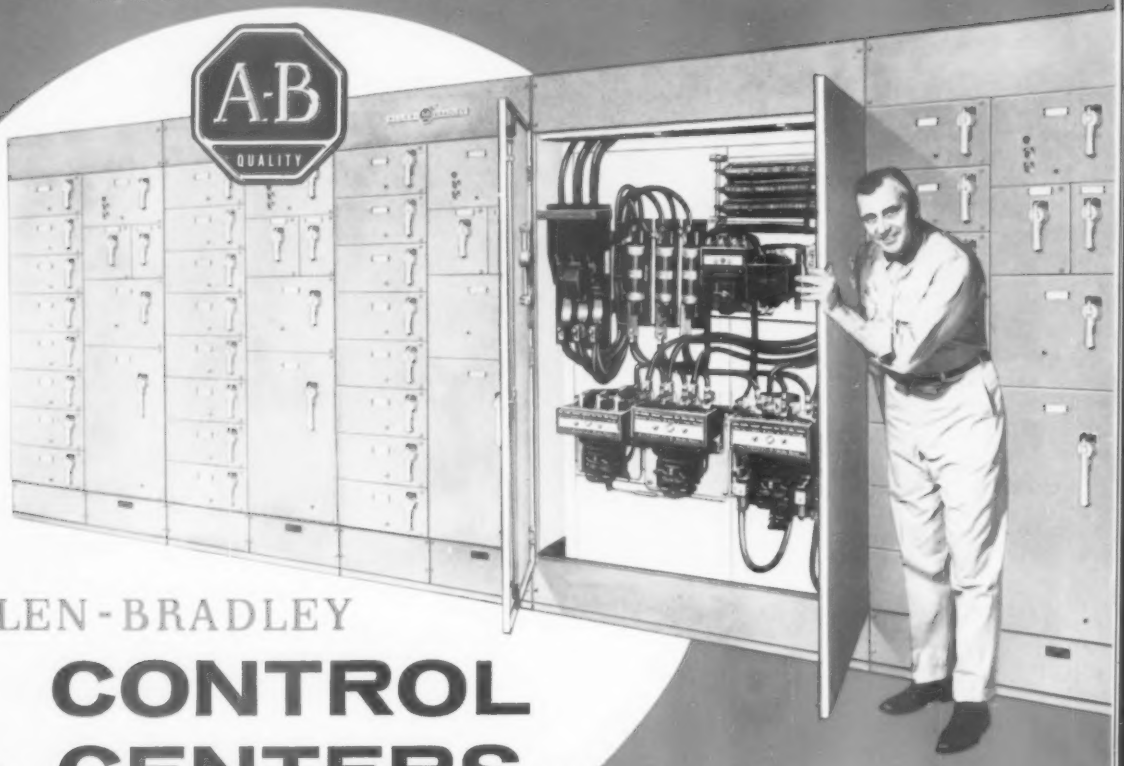
ALLEN-BRADLEY
MEMBER OF NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

QUALITY MOTOR CONTROL

6-59-AR

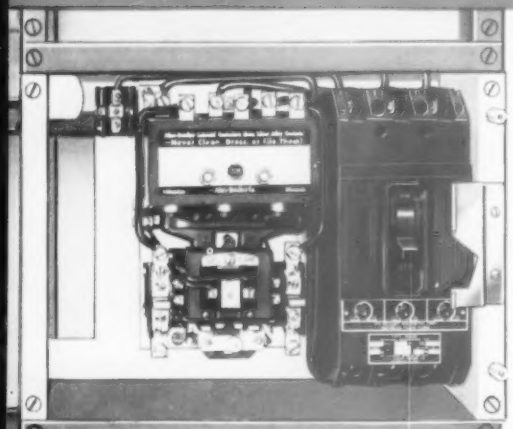
Advanced Design Features in a Control Center . . .



ALLEN-BRADLEY

CONTROL CENTERS

. . . offer tops in
FLEXIBILITY • SAFETY
QUALITY APPEARANCE



This typical unit of an A-B control center shows a Bulletin 709, Size 2 starter and an I.T.E. circuit breaker.

Allen-Bradley control centers are the "label" of a modern plant. They make neat, centralized installations and—where this is practical—do away with individual starter mountings and complicated wiring. The control center may even reduce installation cost—as compared with using individual starters. Here are some of the up-to-date design features which make the A-B control centers so popular.

NEW SPACE SAVING DESIGN—New Bulletin 798 control centers save floor space . . . provide up to 8 units in a 90" high control center unit.

PREMIUM QUALITY FINISH—An exclusive A-B finishing process assures that your control center will retain its attractive appearance over the years. Each piece is *individually* cleaned and phosphated *before* assembly—there are no "bare spots" where corrosion can have a start. Then a rust-resisting primer and a dense finish coat are baked on, providing a fine, tough, and lasting surface.

FLEXIBILITY—A-B control centers are readily adaptable to changes in operating needs—integral plug-in units can be added or modified without internal rewiring. Entire sections are easily added as needed.

SUPERIOR PERFORMANCE—Using the popular A-B solenoid starter—with only ONE moving part—assures millions of trouble free operations. Their double break, silver alloy contacts *never* need servicing.

For "tops" in control centers, you owe it to yourself to investigate Allen-Bradley's Bulletin 798. Write for complete information.

ALLEN-BRADLEY

MEMBER OF NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

6-59-MR

QUALITY MOTOR CONTROL

Know your AIM*... Reading Tube does...

Strapping Machine increases production 900%

READING TUBE CORPORATION, READING, PENNSYLVANIA, uses an Acme Steel Model F1 Semi-Automatic Strapping Machine to bundle packages of copper tubing. Since the introduction of the F1 into the packing line there had been a 900% increase in the number of coils strapped. (Idea No. S2-27)

Acme Idea Man H. W. Croop, Jr. works with Reading Tube, and many other progressive companies.

The F1 strapping station is located at the end of a fast moving conveyor line. Here the operator stacks the packages of tubing four high and inserts the strap through the eye of the coil. The finger-tip controlled F1 automatically delivers the correct length of strap, draws the strap to the predetermined tension, and cuts and permanently spot welds the ends together . . . all in one fast operation.

***Know your Acme Idea Man.** He is sure to provide clues to better ways of protecting and shipping your products. Call him today at a nearby Acme Steel office. Or write Dept. FAS-69, Acme Steel Products Division, Acme Steel Company, Chicago 27, Illinois. In Canada, Acme Steel Company of Canada, Limited, 743 Warden Avenue, Toronto 13, Ontario.

ACME STEEL **STEEL STRAPPING**

FACTORY

IDEAS OF THE MONTH

By LEWIS K. URQUHART, Consulting Editor

(For more information, circle item numbers on Reader Service Card next to back cover)

For critical parts and components dunt forget those re-usable steel and aluminum shipping containers (*DeVilbiss*). Handsomely illustrated 12-page brochure will bring you up to date in this area. **(291)**

No flop, your open house, if you use 4-page checklist and work-sheet (*Dartnell*). Covers the party—from A to Izzard. For free. **(292)**

With new multiple lockout (*Dayton Rogers*) up to seven electricians can work with a song in the heart and the assurance that the power source can't be cleared until each man has removed his own padlock. **(293)**

Take five and check the lighting at your desk with Lightester (*Smithcraft*). If the pink tab turns to grey in two minutes or less, you're sitting pretty. Then take this handy-dandy little slicker (it's free, of course) into the shop and measure lighting efficiency at half-a-dozen workplaces. You might just possibly be amazed at what you're not getting. **(294)**

Small plants (20 to 100 people) can soothe coffee-break headaches with new percolator (*Perk-Ette*). Can be operated with or without coins. No water connections needed. And occupies only 3 sq. ft. of space. **(295)**

Booklet of the Month just has to be "Avoidable Cost Replacement Formula" (*Jones & Lamson*). New light on difficult subject. **(296)**

Yes, you can throw away those Gauztex sweatbands (*General Bandages*). They're priced right for one-time use. Wonderful, say we, for the boys who have to wear helmets or goggles. Summer'll come on June 21! **(297)**

Or maybe Coolband is for you and your fellow sweaters. Or Cool-Ur-Hat. Both these perspiration absorbers (*Mine Safety Appliances*) are made of soft, light, highly absorbent cellulose sponge. **(298)**

Here's help for headscratchers in steel products. New folder (*Signode*) lists "11 Ways to Reduce Costs and Improve Your Packaging of Steel." **(299)**

Lubrichaos in your plant? Check lucky number on Reader Service Card to get "Report to Management" (*Lincoln Engineering*). Tells how automatic centralized lubrication can save your company folding money. **(300)**

Engineering constants, short-cut tables, technical data frequently used in plant operation—they're all to be found in a handy reference brochure (*Falcon*) that's yours just for the asking. **(301)**

Be a hero to your secretary—and up her performance 20% or so—with Foldamatic Line-a-Time Copyholder (*Remington Rand*). She'll type with her head in normal position instead of to one side. No neckache. **(302)**

Keep an eye peeled for two new fluorescent lamps (*Westinghouse*). One's single-ended, can be mounted in one socket. T'other's U-shaped. **(303)**

First with a brake? Hand pallet trucks (*Multiton*) are now equipped with brake shoe that's applied to wheels by lowering steering handle. **(304)**

Well, sir, a four-in-one roller (*Speedway*) paints all sides of pipe, rod, or cable at one time! What doc ordered for fence-painters. **(305)**

Picnic coming up? Low-cost, 30-page manual (*Organization Services*) fills you in on all details, including physical layouts, organization charts, suggested letters of invitation. Also describes 100 games for children and adults. Handy checklist to jog your memory. **(306)**

Say a fond farewell to cuts, ruptures, punctures by equipping your materials handling trucks with Grip-Matic, a pneumatic tire (*U. S. Rubber*) that's reinforced by thousands of short steel fibers. **(307)**

Your First Five Years is one of three brochures (*Engineers' Council for Professional Development*) your young engineers will thank you for. **(308)**

Aluminum machining chart (*Frasse*) provides recommended speeds and feeds for six operations and sfm.-to-rpm. conversion table. **(309)**

People who work at desks will welcome the privacy they get with L-shaped unit (*Marnay-Rockaway*) consisting of heavy-gage steel back and reversible side, both fitted with frosted, fluted, shatterproof plastic panels. **(310)**

Kiss lock-up troubles good-bye by filing all keys in welded-steel wall cabinet (*Cushman & Denison*) with piano hinges and Yale lock. Keys are tagged, hang on spiral wires, each key positioned according to handy location guide. Cabinet capacities, from 20 to 800 keys. **(311)**

Your glove situation will be well in hand with Plastifabs (*American Optical*). They're plastic-coated to provide abrasion resistance, flexibility, long wear; designed for handling greasy, oily, other slippery objects. **(312)**

More Ideas of the Month in Press Time Report following page 66

NEW HIGHER PERFORMANCE FOR FORMCHROME* SPRAGS

On over-running clutch applications, Formsprag clutches have always provided greatest torque capacity for size and weight, no measurable backlash, extreme precision and long trouble-free life. Now! With newly designed Formchrome sprags, the best over-running clutches provide users with even higher performance.

Here's why! The new Formchrome sprags are made of hardened high carbon alloy steel with chromium diffused into the surface to form a chromium-carbide alloy. Thus, the sprag is corrosion resistant, and has high hardness and abrasion resistance similar to tungsten carbides. Result—sprag geometry is retained over a longer period and clutches can be used on higher over-running speeds. The Formchrome sprag is exclusive with Formsprag—no other clutch manufacturer can offer you its performance advantages.

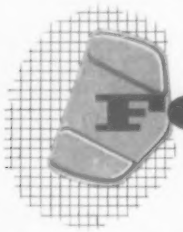
Typical of the higher performance users can now receive from Formsprag clutches is this specific example: A Formsprag clutch using Formchrome sprags was installed in the reaction member of a torque converter and a competitive clutch in another. The competitive clutch showed excessive wear after the equivalent of one year of operation. The Formsprag clutch was run 50% longer and still showed only negligible wear.

There is a Formsprag clutch for every application—from business machines to aircraft. Standard clutches cover a wide range of uses and are described in the Formsprag Catalog . . . send for your free copy. However, to meet unusual requirements, Formsprag engineers will modify a standard clutch or design a special—send your application details.

FORMSPRAG COMPANY
23609 Hoover Road, Dept. 102
Warren (Detroit), Michigan

In Canada: Renold Chains Canada, Limited
In United Kingdom: Renold Chains, Limited
Distributors in Principal Cities

*Formchrome sprags are produced under a patented process. The use of this process in the manufacture of over-running clutches is exclusive with Formsprag.



FORMSPRAG CLUTCHES

World's Largest Exclusive Manufacturer of Over-running Clutches

TYPICAL APPLICATIONS WHERE FORMCHROME SPRAGS HAVE PROVEN SUPERIOR PERFORMANCE

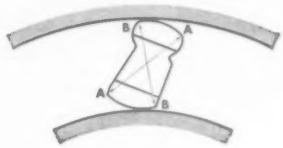
1. Used in operating submarine missile (Regulus II), Formsprag clutch allows alternator to over-run the hydraulic driving mechanism.

2. Backstop clutch on belt conveyor handling bauxite ore is subjected to higher over-running speed, extreme abrasive dust and hot weather—has been in operation a year.

3. Starter clutch for aircraft ground support system allows high-speed gas turbine to over-run starter unit.

For additional information on how Formchrome sprags assure better performing clutches, write for technical paper "Formchrome Sprags".

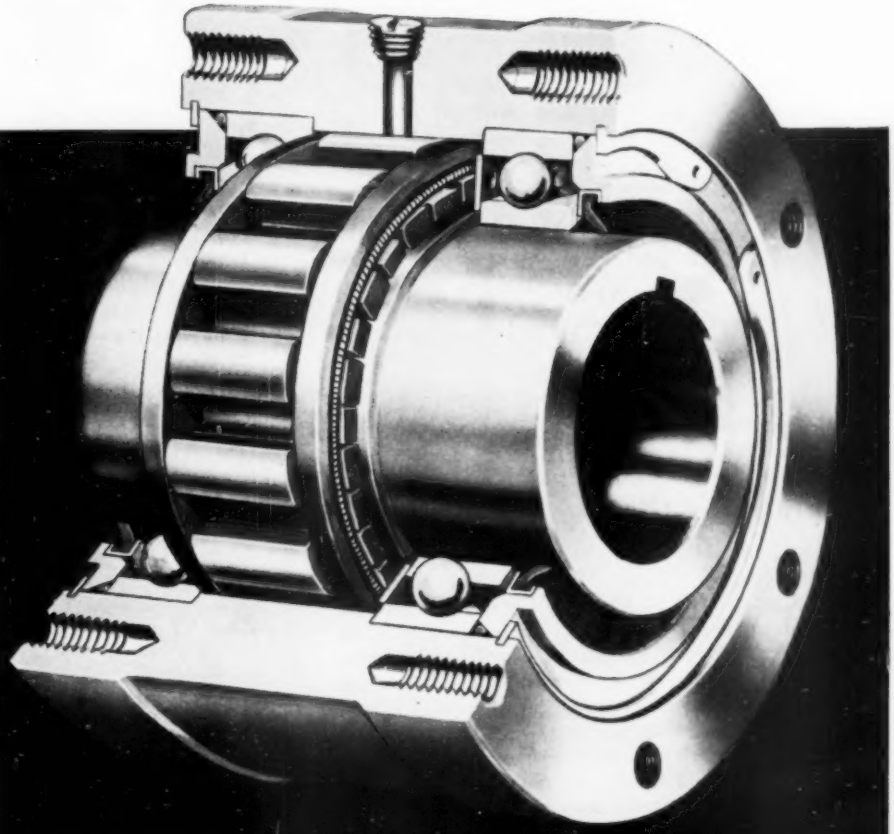
HERE'S



The Formsprag clutch consists of a full complement of shaped sprags, or wedges, located between concentric inner and outer races. Power is transmitted from one race to the other by the wedging action of the sprags. Each sprag is so shaped that dimension AA is greater than BB. Rotation of one race in the "driving" direction causes the sprags to wedge, transmitting torque in full from one race to the other.

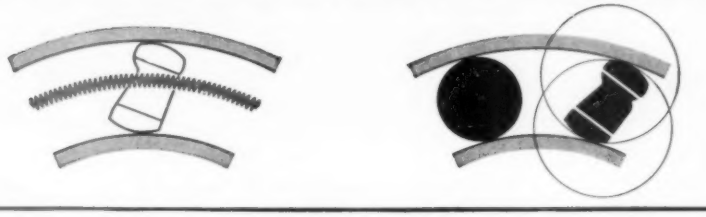
FORMSPRAG OVER-RUNNING CLUTCHES WITH

Micro-photo showing chromium-carbide wear surface (1900 Vickers—80 R_c) of Formchrome sprags. Chromium is diffused into high-carbon alloy steel sprag (62R_c).



OVER-RUNNING · INDEXING BACKSTOPPING

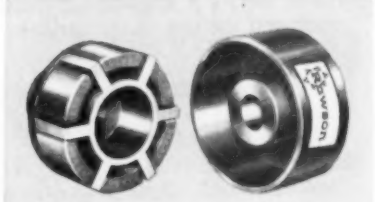
HOW IT WORKS



An expanding coil spring keeps the sprags in light contact with both inner and outer races. There is thus no lost motion, the driving torque being instantaneously transmitted between races. The Formsprag Clutch is so designed that it will transmit a greater torque in relation to its size and weight, than any other comparable type of clutch . . . specify Formsprag on over-running, back-stopping and indexing applications.

Forcing a ball or roller into a curved, wedged space is an old over-running clutch principle. The sprag is, in effect, a "roller" of increased diameter with greater contact surface in a given annular space. Formsprag Clutches engage at constantly changing contact points. Clutch life is prolonged and backlash eliminated. Also, with the inclined surfaces discarded, more sprags can be inserted to increase torque capacity.

RAWSON FOR NO-LOAD STARTS



Specify Rawson Automatic Centrifugal Clutches and Clutch Couplings. They protect the prime mover, eliminate need for costly reduced voltage starting equipment, permit use of less expensive smaller motors to start high inertia loads. Completely automatic and entirely mechanical in operation. Rawson clutches provide full overload protection, never need adjustment. Write for the new Rawson Clutch Catalog now.

For more facts Circle 533 on Reader Service Card

By GEORGE A. HOY, JR., Industrial Management Editor, FACTORY

Honors for the Team

The carpenter shop made a 10-in.-high walnut "T" and mounted it on a base. The sign shop painted on the words "Teamwork Award." The finished product is a traveling award for departments or groups of Gates Rubber Company (Denver) employees. To win it they must show spontaneous teamwork, and get extra results in their work because they did.

Any employee may nominate any group for the award, even if he's a member of the group he wants to nominate. And there's no red tape in the procedure. All the nominator does is write down a recent true story of teamwork that got results in the plant. He tells what happened, which group was involved, and what it accomplished. He can use any piece of paper that's handy. There is no form to be filled out. He sends his nomination to "Teamwork o' the Month," care of the company dividend committee. When received, the nomination is reviewed by four plant operating managers, who select the winning group.

Gates pays a dividend (like a bonus) each year. The citation of the teamwork award committee proves there's a relationship between working together and the size of the dividend check.

No-Hands Lost and Found

Easiest lost-and-found department we've heard of is a bulletin board. That's right, a common or garden variety of bulletin board on a wall near the plant entrance of the Georgia Division of Lockheed Aircraft Corporation (Marietta, Ga.). At the top of the board are the words (as you might expect), "LOST AND FOUND."

Employees who find a stray glove or hat or what-have-you just hang it on the board with pins provided nearby.

One limitation: It's a poor way to handle diamond necklaces and stray wallets full of bills.

Man's No Square

No, he's a cube, according to Dr. J. P. Guilford, University of Southern California psychologist, who directed army testing during both world wars. And measuring man's abilities as though they were square could be a big stumbling block in the path of accurate psychological testing.

Guilford and other USC researchers have put together a three-dimensional model of intellect, with each dimension representing a way in which abilities differ. Says Guilford, "We have been attempting to measure in one dimension what is actually multi-dimensional. Assessment of man's intellectual resources should be in the form of multiple scores and profiles, instead of the few scores that have been customary. The findings imply that a new approach to vocational guidance and testing is necessary."

When Jury Duty Calls

Most plant employees make out fine financially when they're summoned to jury duty, says the National Industrial Conference Board.

Citing a recent study, the Board shows that two out of three supervisors get their full salary in addition to their jury duty fees from the state. And citing a study made about two years ago, the NICB shows that 86% of salaried employees and 53% of hourly rate workers lose no income while serving. As a rule, hourly workers' jury fees are deducted from their regular pay. Salaried workers—non-supervisory employees included—more often are permitted to keep the fees in addition to their regular pay.

Most firms not only pay employees during jury duty, but encourage them to serve if it will not work a hardship. Problem is, most plant supervisors are important enough to be sorely missed when they're away from the plant.

Pastors in the Plant

"I've helped many plant employees . . . and solved the problems of a few," said Chaplain Charlie Martin of D-X Sunray Oil Company (Tulsa) to a *Wall Street Journal* reporter. (Martin was just one of many plant chaplains found by reporters James Tanner and Louis Kraar in U. S. plants.)

As an example of his work, Martin told the story of a worker accused of bootlegging by local police. He was promptly fired by the company. He protested his innocence to Martin and was later upheld by the courts. Martin helped him get his job back. For Martin this kind of counsel and help to others is an everyday routine. In 1957, for example, he made 6182 "contacts."

Reporters Tanner and Kraar feel the work of religious counselors is gaining stature in corporate affairs. And unions are encouraging men of the cloth to join their ranks in a professional capacity, too. Both the National Association of Manufacturers and the AFL-CIO have recently created religious departments within their organizations.

Most important ingredient for ministerial success in the plant: autonomy. The minister's work must be confidential, must not be under any control. Chaplain Martin, for example, reports no names or details in his annual report to management—just the number of contacts.

Wide, Wide Viewpoint

If you figure your management development program is a pretty slick scheme, here's a shocker for you.

It comes from the halls of the opposition (if you're so inclined). From Local 3 of the International Brotherhood of Electrical Workers, to be exact.

One morning this spring, 44 paid officials and business agents of the local gathered for the first of a series of lectures on world affairs. The course was given by a young teacher on leave from Vassar College. The course objective: Give the students a "feel of the world." Says union head Harry Van Arsdale Jr. (according to *The New York Times*): "International problems are becoming such an important part of daily living no union official can do his job adequately without knowing more about them."

How many hours' training in world problems are your supervisors scheduled for?

Sauce for the Gander

The union contract expired last August. Negotiations started hopefully, dragged on, got nowhere. Employees wanted eight cents, a one-year contract, full retroactivity. The employer offered three cents, a three-year contract, one month's retroactivity.

Each side was adamant. So the six members of the Office Employees' Union hit the bricks. Pickets started their slow march.

Sound like a simple slice of Americana? Not quite. The employer in this case is a giant with two heads. It's none other than Walter Reuther's big Dodge Local Number 3, which in this case appears to be unable to appreciate the advantages that will automatically come to everybody if employees get the raise they want.

Boost for Home Study

Don't turn up your nose at home study. Or at guys (like the one in the cartoon) who get their lessons by mail.

According to Clark L. Hosmer, U. S. Air Force colonel with the Industrial College of the Armed Forces, correspondence study has been shown to produce learning equal or superior to campus study, as measured by tests. Hosmer lists two advantages of home study:

- Correspondence students can progress at their own rate.
- Correspondence study costs are about one-fifth those of campus study.

Of course, campus students have the opportunity to discuss subject matter of their courses with instructors and classmates, and this is a real advantage. But Hosmer feels it's wrong that few correspondence students get full academic credit for completed work.

Problems of testing are the main reason they don't receive credit. But if open-book tests are used, the correspondence student and the campus student are on equal ground, and the correspondence student is able to perform well.

Since open-book tests produce more learning and better retention than closed-book tests, Hosmer feels they should be used more extensively. This would help give the correspondence student the academic credit he deserves.

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FACTORY

BOOKS

By WARREN J. KING, Manager
Features and Departments, FACTORY

How Is Your Writing Skill?

If it's not what you'd like it to be, here's your guide to improvement. *Successful Technical Writing* has most of the answers you're looking for. It's designed to help the established technical writer improve his skill with the written word. But it's also a good starting point for the engineer, scientist, or technician who has not yet written.

The book starts with the simplest writing job, then advances through the most difficult. Its examples of actual published material help explain important angles. It also covers such basic points as how many pages of typewritten manuscript might be needed for a specific job, what illustrations are best, how to get and present them, and how long the writing job should take.

The book's strongest point is its step-by-step approach to all phases of technical writing. It not only deals with the writing job itself but also tells where to look for ideas, how to evaluate them, how to build them into an outline, and then how to work with editors and publishers to get the ideas into print. In addition to sections on technical articles, reports, papers and books, including textbooks and handbooks, it covers military and industrial training manuals and industrial advertising.

The author, no novice at writing, speaks with authority backed by practical experience. He has written over 1000 technical articles, has three books to his credit.

Successful Technical Writing, by Tyler G. Hicks. McGraw-Hill Book Co., 330 West 42nd St., New York 36. 294 pages. $5.50.

For Easier Interviews

Here's a really good book to help you with a complex and time-consuming activity. In *The Executive Interview* you'll find the daily problem of face-to-face communications cut down to manageable size. Basing their nicely styled text on sound psychological principles and professionally tested interviewing techniques, the authors get to the heart of management communications.

Here's a sample of the authors' insight. "No conversation is ever unimportant to an employee if it involves his boss. No matter how casual the exchange may be to you, you can never afford to forget that it may be the high spot in his day."

The authors suggest you'll get further in your daily interviews with employees, associates, and superiors if you "think of the exchange as a conversation or another contact in a developing relationship."

Well-handled chapters deal directly with the role of listening, the art of constructive criticism, counseling, dealing with emotional problems, and keeping control of controversy. If a busy manager wants quick, substantial help in these areas, this book is for him.

The Executive Interview—A Bridge to People, by Benjamin Balinsky and Ruth Burger. Harper & Brothers, 49 East 33rd St., New York 16. 209 pages. $4.

Latest on Air Handling

The 1959 *Heating, Ventilating, Air Conditioning Guide* represents one of the best buys (at a mere $12) for any plant engineer's bookshelf. It's an annual publication. But the advances and improvements in this field are developing at such a rapid pace that the frequency of publication is well justified.

This reference book represents the bible for air handling. It's stronger on the design function than on the maintenance angle. However, any plant engineer knows that good maintenance starts with proper design. (This also is the prime reason FACTORY announces each revision of this work.)

This year the size has been changed to an 8½x11-in. page from the previous 6x9. And the content has been enlarged to 12 divisions, including some 57 chapters covering type-of-equipment categories. However, both these points add up to better and easier reading and ref-

Turn to page 180

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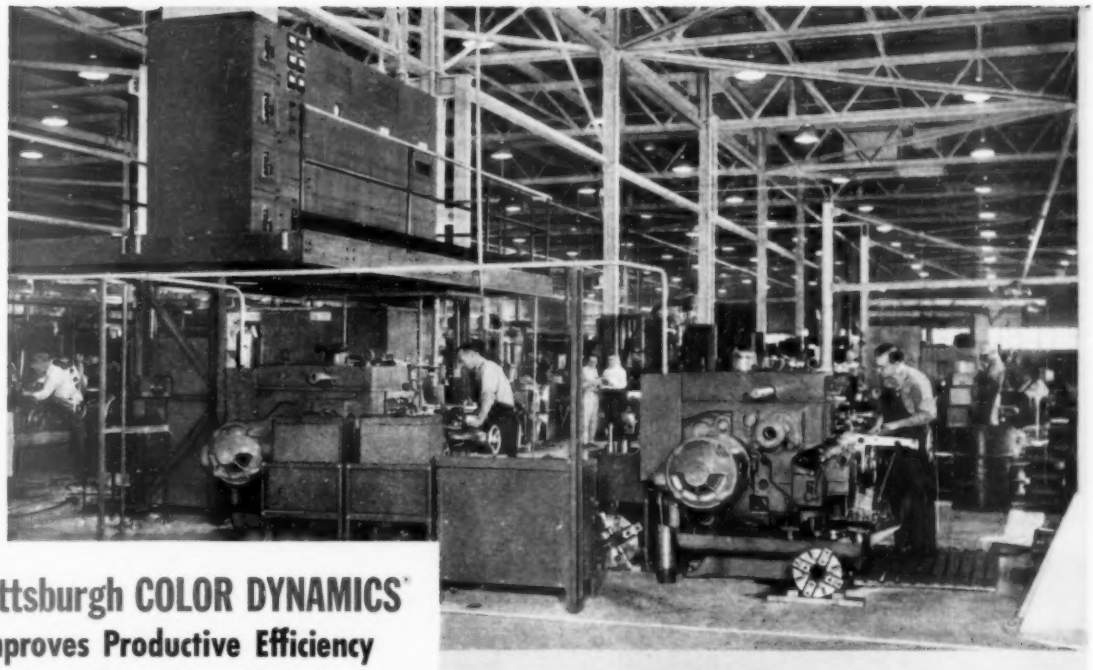

Pittsburgh COLOR DYNAMICS® Improves Productive Efficiency in New Blaw-Knox Factory

New painting system relieves eye strain, reduces fatigue and provides greater safety for workers in modern road-paving equipment plant at Mattoon, Illinois.

BLAW-KNOX

THE NEW Blaw-Knox plant at Mattoon, Illinois, is another convincing example of the improvement in productive efficiency, safety and morale resulting from the use of Pittsburgh COLOR DYNAMICS.

● **This plant is devoted** to the manufacture of road-paving equipment—concrete pavers, spreaders, mixers, finishers, bituminous paving machines and road wideners. The 300,000-sq. ft. structure was designed by Sverdrup & Parcell, Inc., St. Louis, Mo., architects, and erected by the George A. Fuller Company of Chicago.

● **The interior** of this entire plant was painted according to the principles of COLOR DYNAMICS. The beneficial effects of this painting system are summarized in this comment by A. J. Cox, general manager of the Blaw-Knox Construction Equipment division:

● **"We selected colors** for interior walls and ceiling to create more cheerful surroundings for our workers. Stationary as well as moving parts of machines were painted in colors that help operators see their jobs better. Eye strain is relieved. Nervous tension and physical fatigue are reduced. Safety colors mark hazard areas and safeguard workers against dangers of time-loss accidents.

● **"Our experience** since opening the plant confirms our judgment that properly planned colors are a boon to management and workers alike. They are an aid to greater productivity. The pleasant environment enhances morale. Our entire work force takes pride in our plant's appearance. Work areas are kept clean, simplifying housekeeping. The cheerful and pleasing appearance helps us to recruit new employees in an area where skilled labor has been hard to get. And we enjoy all these benefits at no greater cost than conventional painting."

● **This new Blaw-Knox plant** is only one of thousands of factories in which productive efficiency has been improved by the use of COLOR DYNAMICS. Try it in your plant—in a department or on a machine or two—and see the difference it makes.

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The Mahon Power Operated Rolling Steel Doors shown here are installed in openings 48'-5" x 15'-6". The Roll-up Curtains are constructed from 6" Jumbo Slats of 16 Ga. Galvanized Steel which is Bonderized and Dip-Coated with Oven-Baked Enamel.

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Above is a New, Enclosed Loading Dock at Mars, Inc., Chicago, Ill., Manufacturers of the famous Mars Candy Bars and numerous other confections. Four Mahon Power Operated Rolling Steel Doors, 48'-5" x 15'-6", are installed in the loading dock openings. Walter J. Olson & Co., General Contractors.

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LINK-BELT SS CLASS BUSHED CHAIN. If your conveyor or elevator must be lengthened, or load increase accommodated, you can install this all steel chain in place of C Class *without changing sprockets!* It offers hardened joint bearing surfaces for greater wear resistance in heavy-duty conveying and elevating. Smooth, tough joint surfaces repel gritty materials, prevent packing, and resist abrasion.

Full information on these chains . . . plus a broad line of attachments and sprockets—is contained in Catalog 1050. Get your copy by writing direct . . . or call your nearest Link-Belt office or authorized stock-carrying distributor, listed under CHAINS in the yellow pages of your Phone Directory.

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erence, as well as to improved illustrations, charts, and tables.

Heating, Ventilating, Air Conditioning Guide 1959 (37th Ed.). American Society of Heating, Refrigerating and Air Conditioning Engineers, 62 Worth St., New York 13. 476 pages. $12.

Incentives Round-Up

For those contemplating installation or major revision of incentives, here's a good reference. Explains different types of incentives and compares them. Sets forth 11 basic requirements of a good incentive plan. This should be useful for anyone auditing his present set-up. One chapter covers the field of supervisory incentives. However, there is little to guide the reader in establishing incentives for indirect labor or maintenance workers.

Wage Incentives (2nd Ed.), by J. Keith Louden and J. Wayne Deegan. John Wiley & Sons, 440 Fourth Ave., New York 16. 227 pages. $7.

The Grinding Wheel—Thoroughly updates 1951 edition; contains over 100 pages of new material including four new chapters on mounted wheels, reinforced wheels, automation and advanced mechanization, and safety. Also features an eight-page trouble-shooting chart. *By Wm. F. Schleicher. Grinding Wheel Institute, 2130 Keith Building, Cleveland 15. 532 pages. $4.95.*

Wage and Salary Administration—Here's an excellent reference book for all people with plant operating responsibilities. Strong point is its complete coverage of the field. *By Lawrence C. Lovejoy. The Ronald Press Co., 15 E. 26th St., New York 10. 468 pages. $7.*

Basic Facts on Productivity Change—This is the best work we've seen on this subject. The author makes a straight-to-the-point presentation in a small book on a big, complicated subject. Illustrated with plenty of tables and charts. *By Solomon Fabricant. National Bureau of Economic Research, 261 Madison Ave., New York 16. 49 pages. $1.*

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Fountain unit for Connecticut General's print shop employees is centered in the room. Towel dispensers located a short distance from the fountain draw employees away to avoid congestion, speed washing.

At Connecticut General Life Insurance Co., Bloomfield, Conn., Mr. Raymond I. Benjamin, Building Superintendent says: "Our new, modern office building has been planned to prevent jam-ups during rush hours. Principles of washroom design, advocated by Scott Paper Company's Washroom Advisory Service, were adopted to help us overcome washroom traffic problems.

Notice wall-mounted washbowls in men's room — a Scott suggestion that leaves floor areas unobstructed for quicker sweeping and mopping.

Scott's Washroom Advisory Service offers free booklet on principles of washroom design for efficiency, pleasant appearance, low upkeep

Scott's experience in helping to design and remodel nearly a million washrooms for industry is distilled in this illustrated 32-page booklet we'll send you without cost or obligation. Send for it today.

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SCOTT PAPER COMPANY
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FACTORY FILMS

The Green Drum shows the production of ferroalloy, covering operations from the mining of ore to the shipment of finished products. Portions of the film were photographed at company's mining sites in Africa and on the U. S. Colorado Plateau. 16mm, color, 23 min. Write to:

Vanadium Corp. of America, 420 Lexington Ave., New York 17.

These Are My People tells the story of the natural gas industry from its beginnings in the early 1800's to the present day. The film was shot at 16 different locations throughout the country. One sequence shows how salt brine drillers unexpectedly struck natural gas. 16mm, color, sound, in two versions—28 min. and 13½ min. Write to:

The Columbia Gas System, Inc., 120 East 41st St., New York 17.

Work Sampling Simulation demonstrates this work measurement technique. Five days of work sampling are simulated through observations of office operation. The accumulated percentages of 10 persons may be plotted by viewers on accompanying control charts to stress the principle that the greater the number of observations, the greater the accuracy. 16mm, sound, b&w, 22 min. For loan or purchase, write to:

Chance Vought Aircraft, Inc., Dallas, Tex.

How to Create the Best Climate for Decision-Makers is the subject of this film. It discusses the proper balance between keeping workers happy and having a realistic approach to getting full cooperation from them; when and when not to apply group decision-making; and how to keep the wheels rolling for increased production. 16mm, b&w, sound, 18 min. (Price: rental $27.50, purchase $135.) Write to: *I. C. R. Corp., 281 State St., New London, Conn.*

Industrial Material Handling Films is a 16-page revised catalog with brief descriptions of 63 films. All are 16mm, and available on loan. For copy of catalog, write to:

Material Handling Institute, 1 Gateway Center, Pittsburgh 22.

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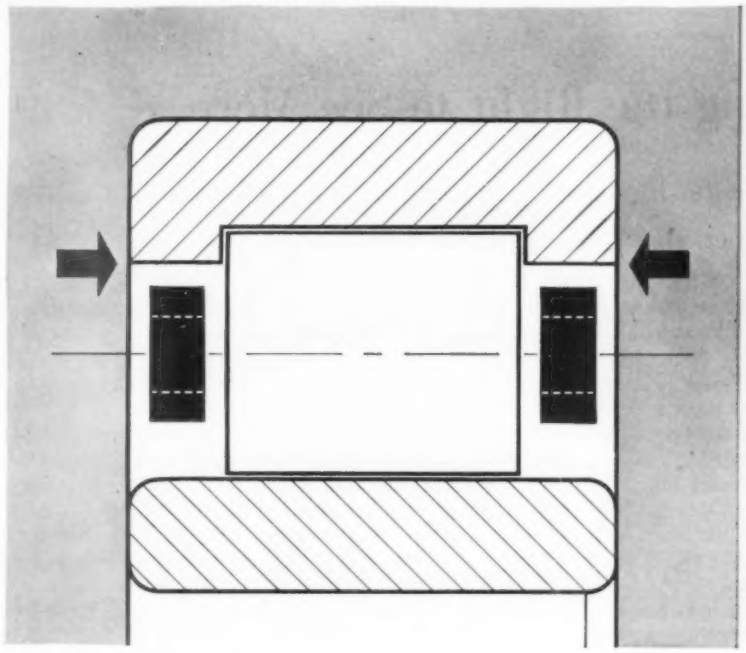
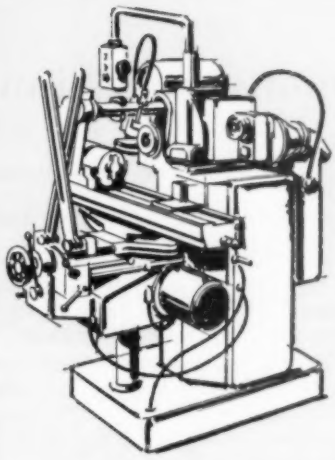
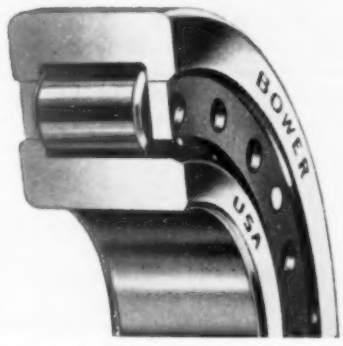




PRECISION MACHINERY relies on Bower Straight Roller Bearings to carry heavy loads, still hold fine tolerances.

Bower's sturdy "shoulders" increase capacity at no extra cost... reduce maintenance, too!



Bower Straight Roller Bearings feature: 1. Integral shoulders for increased capacity, longer roller life; 2. Crowned rollers to distribute load more evenly; 3. Composite cage to guide rollers in operation.

"Two-Lip" design of Bower straight roller bearings provides a more rigid race, better roller alignment

Bower straight roller bearings can carry heavier loads longer, with less maintenance. Yet you get these advantages at *no premium* in price, thanks to Bower's special "two-lip" design!

Integral twin-shoulders make the outer race more rigid for maximum capacity within a load range. And these precision-ground shoulders keep the rollers in alignment at all times to reduce friction and wear. Result: you can depend on Bower straight roller bearings to run quieter, stand up longer in *your* machines—with little or no maintenance.

For straight *or* tapered roller bearings, see the bearing specialist who handles Bower bearings. He stocks a complete line of *both* types; gives prompt, efficient service. Call him for replacements!

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BEARING BOWER ROLLER BEARINGS SERVICE

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By PAUL A. KING, Attorney, Bigelow-Sanford Carpet Company, Inc.; Member, New York Bar

Unions Are Winning the Right to See More

These three cases point up a growing trend. Information long held sacred as management's exclusive business now must be shown to the union.

You don't always have to give production and sales information when the union asks for it. You do have to give wage and hour information.

When the union asks for wage data—says it needs it for current negotiations—better give it, said a U. S. court of appeals. "It appears a union's right to *wage* information cannot be seriously challenged."

But when it came to *production and sales* information the court played a different tune. Distinguished the two this way: "Wages and hours are the heart and core of the employer-employee relationship, and information concerning existing and past wage rates and patterns is essential to the union to enable it to bargain intelligently. This is not necessarily so with respect to what the employer's records show about how much, or at what cost, or in what time he produces his goods, and how or at what cost or in what volume he sells them. We do not say that information on production or sales would never in any circumstances be required, but only that it need not always be disclosed on the union's request . . ."

In plain language, before you dish out production and sales data when the union requests it, think twice. We hate to say it, but, because it's not a black-and-white matter, the opinion of your plant lawyer or labor relations law expert should come in handy here.

Unions are entitled to group insurance cost data, says a recent NLRB ruling.

And here's another case where the NLRB butchers the sacred cows pasteurized by employers for these long years. Employers have long refused to turn over wage data to unions. None of their business, they reasoned. But the NLRB said it was their business and then there began a parade of management's precious secrets that had to be unbared to the union. Case after case was handed down by the NLRB saying the union was entitled to all sorts of employer data. Latest in the parade are group insurance costs, group insurance booklets, and plant rules. The Board ordered Stowe-Woodward, Inc. (Newton Upper Falls, Mass.), to come across with the requested information in these areas (even though the union had access to some of the data from other sources). Told the company it had committed an unfair labor practice.

Some of the forms your personnel department uses may have to be turned over to the union.

It hasn't happened yet, but it sure seems to be on the way—two personnel departments for employees. One manned and run by you, the other by the union.

In many companies this has already happened with group insurance. The insurance plan is managed by the union; the forms are dished out by the union; the benefits are paid through the union. But it's the company that pays the bills.

Another inroad on personnel prerogatives was made at Harshaw Chemical Company (Cleveland). Recently, the company decided to install three new forms. One for attendance and changes of address. Number two to record employee performance and conduct. Number three for reprimands. The company had been using a different reprimand form for years. Let's see them all, asked the union. No soap, said the company. We'll let you see only the reprimand.

At the arbitration hearing, the union made a big thing out of the employee performance and conduct form. Claimed it needed the data on it to process grievances. For example, it argued, notations on the form might have been the basis for employee discipline. It further claimed it was supposed to help employees with their job problems. The forms would aid in this activity.

The arbitrator agreed with the company as to the attendance and change-of-address forms. But hedged on the performance and conduct form. The union can't have them when they are *not* used in disciplining employees, he ruled. But if they are so used, the company can't take advantage of them in a discipline case unless the union is shown copies. He evolved this principle: If the forms are used for company housekeeping, they are not the union's business. But if used to impose discipline, they are.

Layoff Profiteer Didn't Get Far

This imaginative employee was denied layoff. It would have meant more pay than for working.

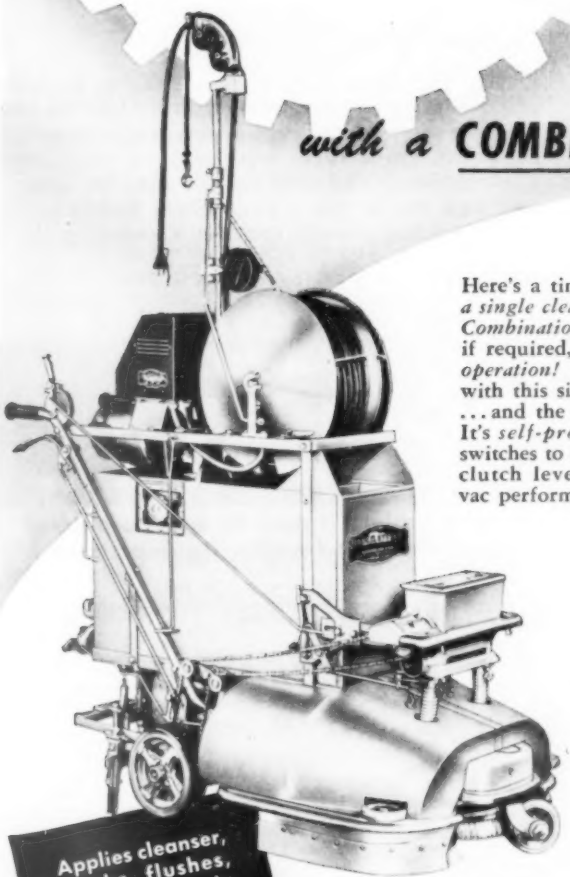
SUB + SUC = AST ("a soft touch") is the equation we were all afraid of—until Arbitrator Sylvester Garrett came along to prove it was wrong.

Things weren't going well at one of U. S. Steel's many plants, with the usual result—layoff. One seniority-heavy employee requested a layoff instead of taking a demotion. He had it figured out this way: The company's Supplementary Unemployment Benefits plus the State's Unemployment Compensation would be more than his pay on the demoted job. So let's take layoff and relax, he reasoned. How did he think he'd ever be able to get away with it?

On previous layoffs, employees had been allowed to

MECHANIZE all Scrubbing Operations into 1

with a COMBINATION SCRUBBER-VAC!



Applies cleanser, scrubs, flushes, and picks up—in ONE operation!

(Powder Dispenser and Level Cable Wind are accessories)

Here's a timely answer to the need for reducing labor costs—*a single cleaning unit that completely mechanizes scrubbing.* A *Combination Scrubber-Vac* applies the cleanser, scrubs, flushes if required, and picks up (damp-dries the floor)—*all in one operation!* Maintenance men like the convenience of working with this single unit... the thoroughness with which it cleans ...and the features that make the machine simple to operate. It's *self-propelled,* and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs quietly.

Finnell's 213P Scrubber-Vac at left, an *electric* unit for heavy duty scrubbing of large-area floors, has a 26-inch brush spread. Cleans up to 8,750 sq. ft. per hour (and more in some cases), depending upon condition of the floors, congestion, et cetera. (The machine can be leased or purchased.) *Finnell* makes a full range of sizes, and *gasoline* or *propane powered* as well as *electric* models. From this complete line, you can choose the size and model that's exactly right for *your* job (no need to *over-buy* or *under-buy*). It's also good to know that *a Finnell Floor Specialist and Engineer is nearby* to help train your maintenance operators in the proper use of the machine and to make periodic check-ups.

For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2506 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

take a layoff instead of a lower paying job if the employee thought the job was undesirable or if he wanted to help out a junior employee with family responsibilities. Since, in the past, employees had a say about taking layoff, this fun-loving worker wanted more of the same this time. But the horrified arbitrator ruled against this employee. It just can't be done, he said. And so horrified was he, that he ruled this way without even considering whether the past practice of yielding to the employee's preference was a local condition which had to be kept up.

Worker Bribes Won't Do

Two rival unions paid workers for attendance at campaign meetings. Both lost out.

Freedom of choice is an important matter in Little Rock, Ark. And when schools are an issue, it's bound to hit the national newspapers. But unnoticed in the papers was the question of freedom of choice of unions by Little Rock employees of the Teletype Corporation.

While it lasted, this company's workers enjoyed the enviable role of being pursued by two rival unions who thrust dollar bills in their pockets.

The International Brotherhood of Electrical Workers and the Communication Workers of America both bid for worker attendance at campaign meetings. One offered $5 for attendance, the other upped the ante to $7.50, then the first pushed it up to $10. But all of this went down the drain when the NLRB upset the election.

Neither union paid the money to buy votes, it was generally agreed. Nevertheless, the Board threw out the election, pointing to its well-founded policy of setting aside an election "when a record reveals conduct so glaring that it is almost certain to have impaired employees' freedom of choice." Outraged, the Board proclaimed: "The unions' method of competitive bidding was so blatant and the payments of moneys so excessive that we cannot assume that the election truly reflected the employees' choice."

The decorum-minded Board decried the "atmosphere of the auction rooom."

"Quiet Man" Loses

Employee's personal reasons for refusing to follow orders must be stated early, or he may lose the case.

Where there is a grievance procedure, the rule is: Obey first, grieve later. Any employee who doesn't follow this rule does so at his own risk. He must be darn sure that he has a good reason for disobeying.

This situation generally comes up where the employee

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If your present overhead crane facilities require attention, it may be wise to investigate the possibilities of a crane remodeling job with new Euclid trolleys; available in a range of designs and capacities.

We can specifically cite instances where this plan has been employed to the complete satisfaction of the crane owners.

This Heavy Duty Series "M" trolley incorporates a three reduction spur gear hoist. Recommended for use on cranes subjected to continuous operation in the handling of heavier loads.

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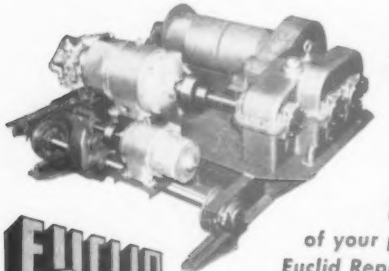

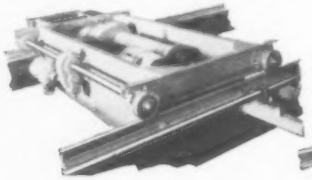

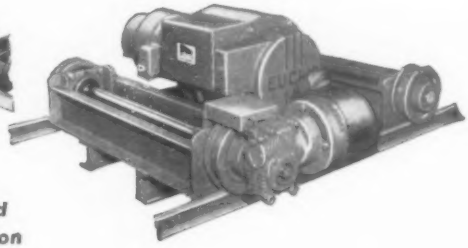

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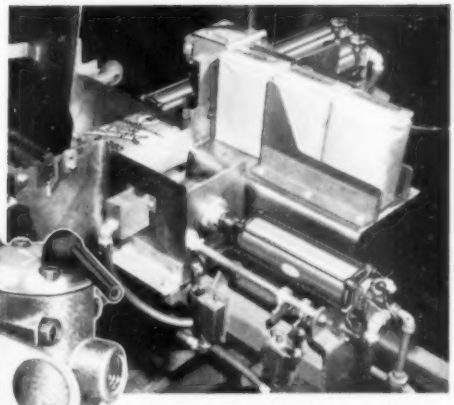

Packaging coffee is simplified by this Bellows Air Motor powered equipment.

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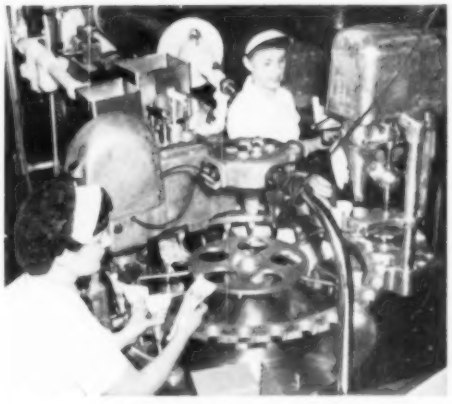
With parts normally available in every tool room, plus one or more Bellows Air Motors, and a little creative ingenuity, you can "spot modernize" scores of operations whose high cost whittles away at profits. The few illustrated here are typical of hundreds we can show you. The chances are good that no matter what you make, nor how you make it, this versatile air cylinder, with its *built-in* electrically controlled valve, can lend a mighty important helping hand to your cost reduction program.



Bellows Air Motors fill ice cream, add nuts and fudge, fold and seal the wrapper in this special machine.

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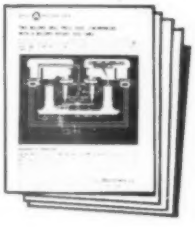

A note on your letterhead addressed to Dept. FA-659, The Bellows Co., Akron 9, Ohio, will bring you basic data: wiring diagrams, installation details, equipment list, on a score of "everyday" operations almost every industry uses—and, if you wish, the services of a Bellows Field Engineer, to help you adapt those ideas to your specific needs.

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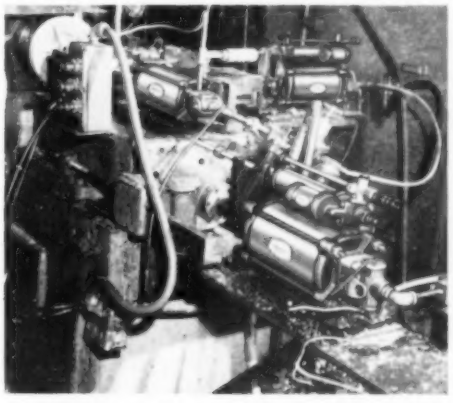

Tail stock, tool bit, and cross-slide are moved by Bellows Air Motors in this lathe conversion.

The Bellows Co.

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Photo courtesy of All-Steel Equipment Inc.

Cutting the cost...of a "mountain" of steel desks!

By utilizing a Clark Slender-Arm Clamp, this company was able to eliminate pallets, thereby eliminating unnecessary overhead. In addition, the Clark Engineers consulting this company, recommended use of the new Triple Stage Upright so that extra high stacking could be accomplished *without* sacrificing the lift truck's ability to work in low-overhead rail cars. The end result was much greater storage capacity, one-time handling between warehouse and loading out, a need for fewer trucks.

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CLARK® EQUIPMENT

refuses to obey because of bad health. For example, he may have an allergy which prevents him from going into a dust-filled room, or a slight hernia which is affected when he lifts heavier-than-usual loads. If the arbitrator determines that his reasons for disobeying are valid, the case will have a happy ending for the worker. An employee is not required to endanger his health. But if the arbitrator doesn't agree, the penalty will be upheld.

The problem is further complicated when the employee refuses to obey without revealing his condition of health—if that is his real reason. After he is fired for insubordination, he unfolds the whole story. For example, an employee of John Deere refused to carry an 85-lb. bearing upstairs. Preferred to hoist it by rope but didn't reveal why. He was suspended for a week. When the full story was told, it turned out he feared he might aggravate a hernia.

Did the arbitrator uphold the suspension? Yes. The arbitrator might have ruled otherwise had the worker told all to begin with. There are many other awards that do hold that way.

Machine Displacement Okay

Two schedulers who were replaced by an IBM machine may have had a gripe, but they didn't have a legitimate grievance under the contract.

Tom Watson's IBM machines save companies money, but often it's by eliminating workers. Thus they sometimes create labor problems. This time, in a contest between worker and machine, the machine came out on top. Arbitrator Raymond F. Hayes officiated.

Two Reynolds Metals aluminum workers handled box scheduling. An IBM key punch machine was installed and it absorbed their task. So they were downgraded. They griped and they grieved under the company's grievance procedure.

The arbitrator who heard the case agreed that the company had the right to eliminate a job classification. But he denied it the right to transfer a job outside of the union. In this case a job was eliminated. But was it transferred to the office workers who ran the IBM machine? No, said Hayes. No new employees had been hired. The job simply had been absorbed by the office workers.

Sleeper's Discharge Stands

The discharge penalty for sleeping on the job is okay, ruled this arbitrator.

The union may call him "hard-boiled" Holly from now on because, with quiet courage, he reaffirmed an old principle of employee discipline. The penalty for a rule infraction may be stiff, but if the employer applies it uniformly, an arbitrator will more than likely uphold it.

Holly is J. Fred Holly, selected by company and union from a Federal Mediation and Conciliation Serv-

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Begins on page 184

ice list to arbitrate their dispute. The company: the Hayes Aircraft Corporation of Birmingham, Ala. The union: the United Automobile Workers. The dispute: about an employee fired for sleeping on the job.

"He was sick at the time." "It was too tough a penalty." "It was an accident." "He was an employee for 5½ years." These were the arguments used by the union.

Casting them all aside as being non-factual or irrelevant, Arbitrator Holly upheld the company. It was not his job to look into how reasonable the penalty was. His duty was to find out: Was it applied properly? It was! In the past, the employer had discharged employees for sleeping on the job no matter who they were.

But don't think for a minute this arbitrator's view is the last word. There are others who might say that the penalty was too harsh—or who might have found mitigating circumstances. A lot of arbitrators don't go for discharge as a first or even second penalty for sleeping on the job.

Wildcat Strike Damages

Company collects damages for wildcat strike despite absence of no-strike clause.

The golfer who isn't lucky enough to own a club for every shot on the course makes some other club do. And a company that doesn't have a clause in its union contract for every situation must put up with some less apt clauses.

No employer should be caught without a no-strike clause but sometimes he is, as illustrated by the case of Gay's Express of Springfield, Mass. This company had a strike on its hands without a no-strike clause in its contract. Instead it reached for its grievance procedure clause and made it do.

The boys had walked out on Gay's Express when it fired truck driver Rainville. Walked out in early September, remained out until mid-December.

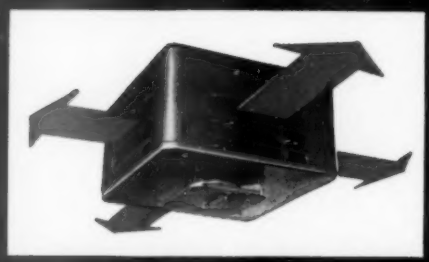
The walkout was a breach of contract, argued the company. Whether or not Rainville's discharge was justified should have been referred to the grievance procedure. A strike was not cricket, it said.

The clause read: "Any dispute concerning the application or interpretation of this agreement that cannot be adjudicated between the employer and the union shall be referred to the general grievance committee, the decision of the committee to be final and binding on both parties."

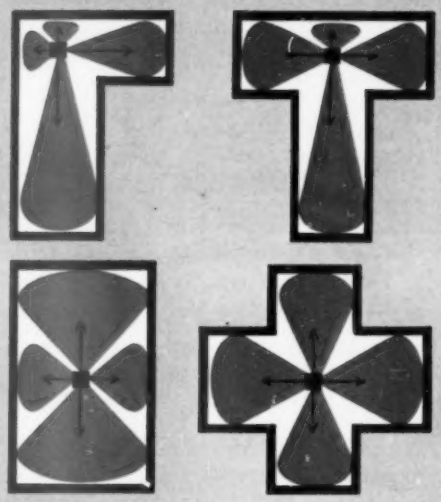
The union argued that the clause didn't say that the grievance procedure was the *exclusive* method of settling disputes.

The U. S. district court reviewing the case didn't quite see it the union way. Strikes are out, it ruled. Otherwise "the union would be free to ignore the grievance procedure and resort to a strike whenever it felt the urge."

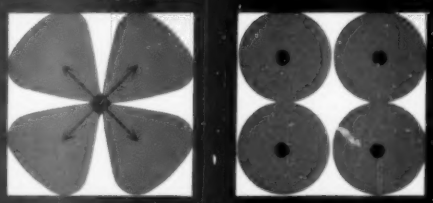
The company was allowed to collect damages for the unauthorized strike.



Carrier "Clover Leaf" Unit Heaters, for steam or hot water, come in eight sizes, ranging from 55,000 to 600,000 Btu/hr.



Adjustable louvers can shape "Clover Leaf's" air distribution pattern to heat any shape area.



One large "Clover Leaf" can heat this 100-foot-square room. It takes four vertical discharge heaters with same capacity to do this same job.

This Carrier 4-way does the work of 2 or more conventional unit heaters

a saving to remember when you modernize your heating system or specify for plant additions

Whether you're building a new plant or modernizing an existing one, you can save money on the heating system by specifying Carrier's "Clover Leaf" Unit Heater. One of these versatile heaters does the job of two or more vertical discharge heaters—or four to six horizontal heaters.

The reason for this unusual performance lies in the "Clover Leaf's" unique method of air distribution. It gives greater heating coverage by discharging heated air in as many as four directions at one time. Using all four of its outlets, the largest of these Carrier units can heat a room 104 feet square. Or blowing air in two directions it can heat a narrow building 136 feet long!

Adjustable louvers make it easy to vary the shape of the "Clover Leaf" air distribution pattern. Without changing outlets or adding accessories it can heat L, T, I or square shaped buildings.

Because of its greater heating coverage you need fewer "Clover Leaf" heaters to do a heating job. That means more than just lower first cost. It also means a lower installation cost, lower operating and maintenance cost—lower costs right down the line.

For complete information about the "Clover Leaf" Unit Heater call your Carrier representative listed in your Classified Telephone Directory under "Heaters—Unit." Or write Carrier Corporation, Unit Heater Department, Syracuse, New York.

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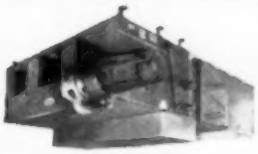
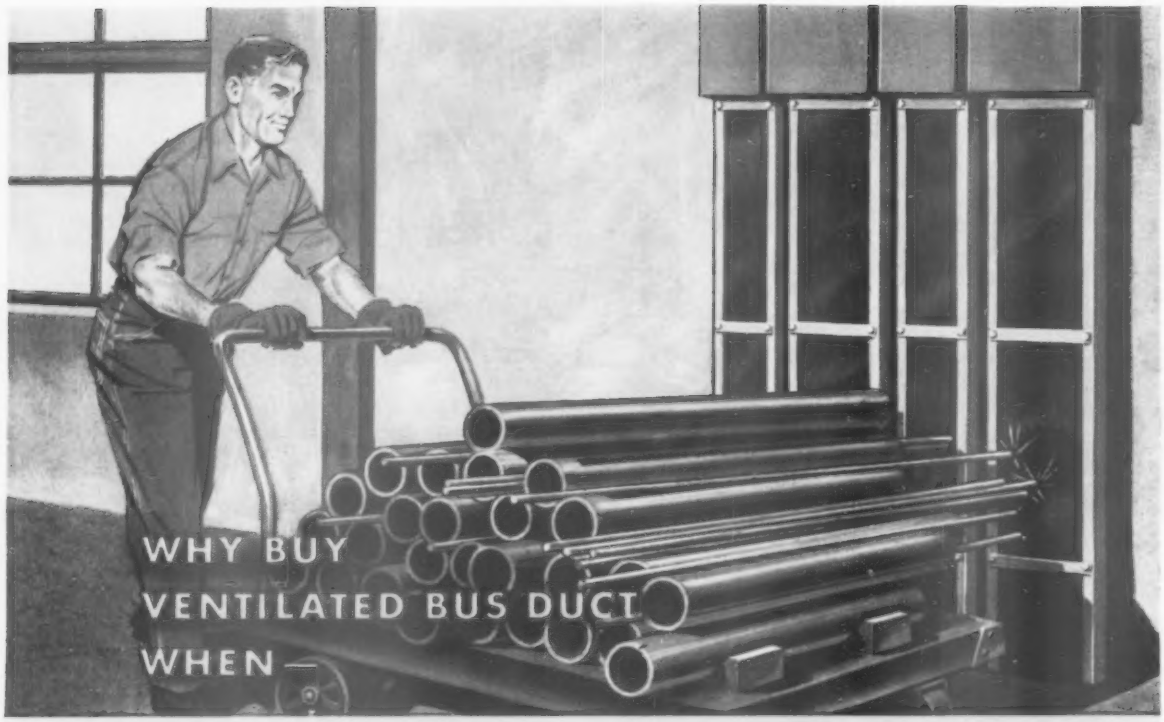


Heating and Ventilating Units



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• Ventilated bus duct may be as vulnerable as it looks. In fact, Paragraph 3644 of the National Electrical Code prohibits its use in certain areas by specifying:

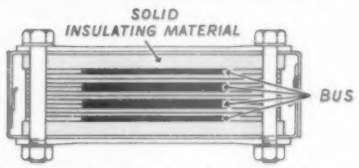
> **"Busways may extend vertically through dry floors if totally enclosed (unventilated) where passing through and for a minimum distance of six feet above the floor to provide adequate protection from mechanical injury."**

All Square D low-impedance duct is totally enclosed! It has no ventilation holes open to falling objects or dust. It's smaller than ordinary ventilated bus duct. It mounts in any position without de-rating. Doesn't it make sense, when buying low-impedance duct, to specify a product that's safer? Square D totally enclosed low-impedance duct costs no more—why settle for less!

Here's Why Square D's

EXCLUSIVE Design

makes ventilation unnecessary



The entire space within the duct and between the bus bars is filled with a solid insulating material which conducts the heat to the surface. There are no dead air spaces inside the duct. Square D totally enclosed low-impedance duct is listed with Underwriters' Laboratories and meets U/L requirements for temperature rise in any mounting position.

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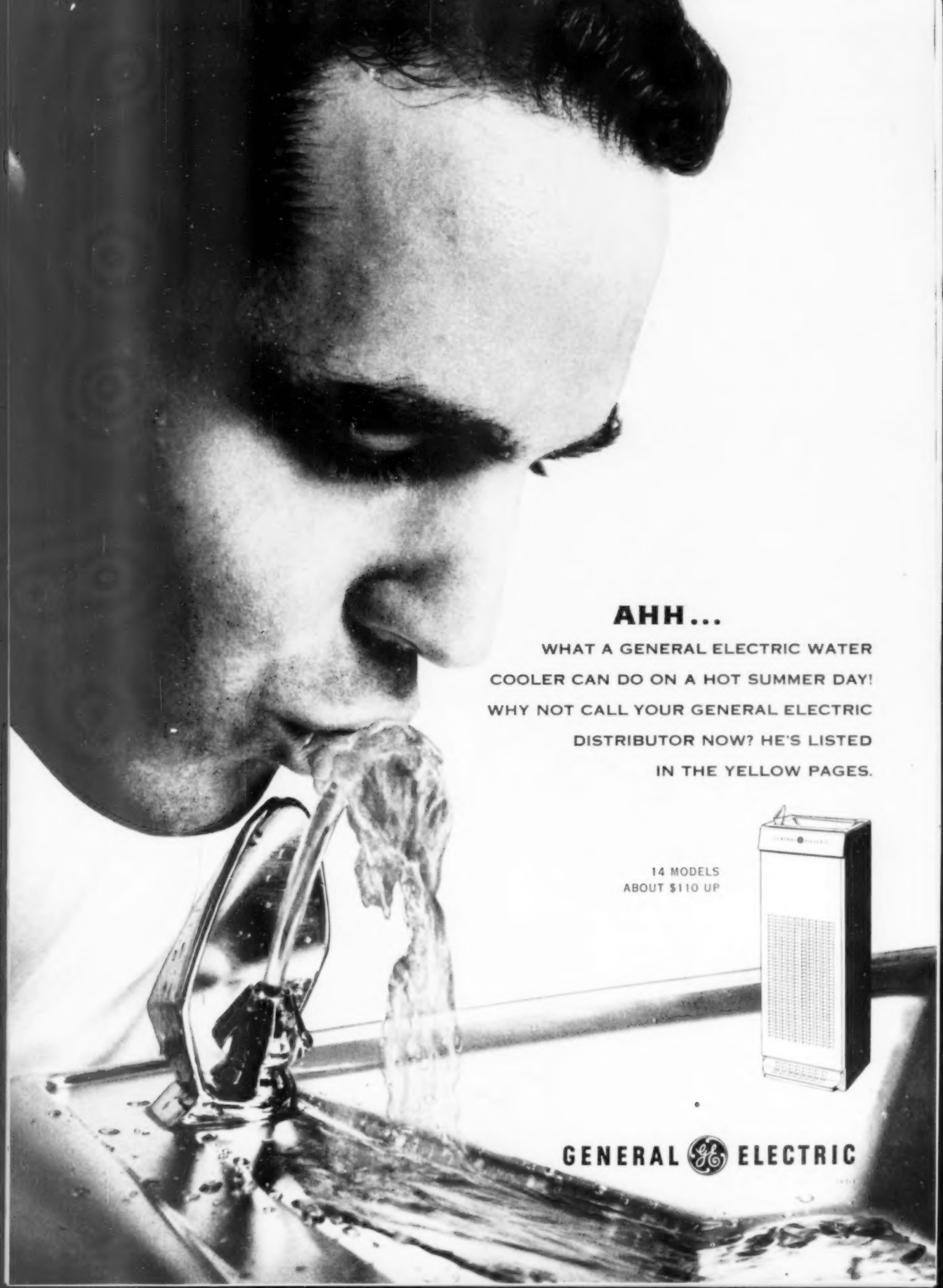
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Staffing Up the Ten Top Plants

FACTORY in May told how the Ten Top Plants of 1959 got set for top efficiency. Here, in these pages, you'll see how they found the right people.

ONLY FOUR of the Ten Top Plants of 1959 (FACTORY, May, page 75) had a major staffing-up problem. The other six were built within 20 miles of their former sites. Does this mean that the men who picked the sites for the stay-near-home plants didn't look outside a 20-mile radius of the old plant? Not so. It wasn't as simple as that.

For the six stay-close-at-home plants the advantage of having a trained, well-established workforce available to operate the plant (with rarely a pause in production) by far outweighed any advantages another area could have provided. For each of these six companies the new plant is a new setting for an established management and workforce. Nearly every employee made the move to the new site. (Charles Bruning Company, for example, had only a 3% loss in a move of 17 miles.) Only a few new hires were needed to meet the job changes that resulted from new equipment, new layouts, and new processes.

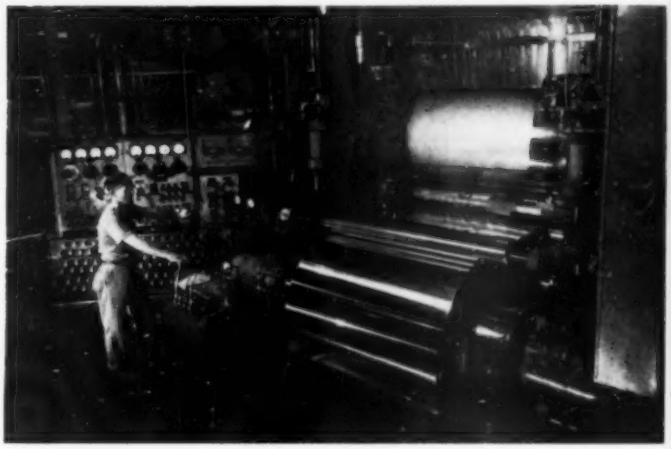
The overwhelming advantage these six companies found in having an intact workforce emphasizes the problem of the remaining four plants —and of any plant that relocates far from home ground. IBM-Rochester, is about 1000 miles from Endicott, N.Y., where its product was formerly built. For Kaiser, the new plant is an addition to a string of plants across the country, rather than a replacement. Cutler-Hammer moved from New York City to Lincoln, Ill., a distance of 1000 miles. Bucyrus-Erie's Richmond (Ind.) plant is a new operation.

Turn the page

PEOPLE Only four of the Top Ten Plants had to worry much about people for staffing. The other six of the Top Ten built so close to home that they could take most of their workers along with them when they moved to a new plant location.

PRODUCTION SKILLS They were adequate in the areas into which the four long-distance movers moved. For each of these four Top Plants the availability of such skills was an important influence on site selection. In fact, each of these four was in the fortunate position of being able to make careful selection of needed men from labor pools that were overstocked.

SPECIAL SKILLS They presented no real problem in staffing, even for the four plants that moved far away from home or headquarters. On the whole, engineers, draftsmen, and other skilled men who sometimes are said to be in short supply were plentiful enough to fill all the needs of the Ten Top Plants. The result: minimum problems in recruiting and training new people.



NEW SKILLS Development of new skills among veteran employees was a common achievement among the Ten Top Plants. Old hands with the company now capably handle jobs they didn't know existed just a few months ago.

MANAGERS They were heavily imported by every plant that moved a long distance. These plants brought along the basic skills and know-how. Such skills were critical in supervising and advising on construction, rigging, and space allocation. They were also essential in screening and selecting new employees and seeing to it that training programs were geared to needs.

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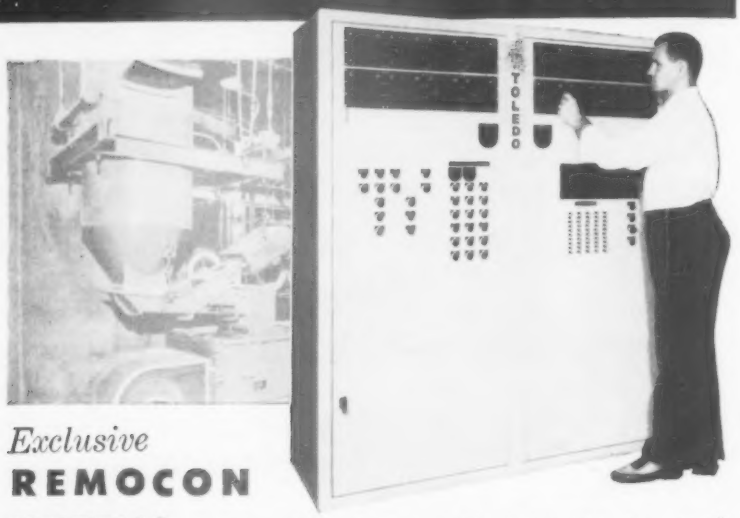

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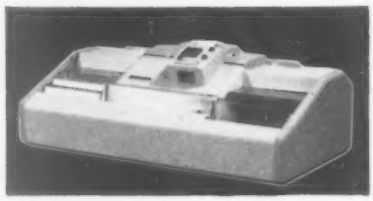

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STAFFING THE TOP TEN
Begins on page 194

For these four new plants the problem of hiring and training a competent workforce was important in the original site selection. The why's and how's of employment and training were subjects of many meetings at every stage of development. And the selection and training work began even before the contractors pulled out their main crews.

LABOR POOL MEASURED

You can see a trend shaping up in the towns selected by the four plants that weren't tied to home plate by their present workforce. Look at these population figures:

TOWN	POPULATION
Richmond, Ind.	39,000
Lincoln, Ill.	14,000
Rochester, Minn.	30,000
Ravenswood, W. Va.	1,000

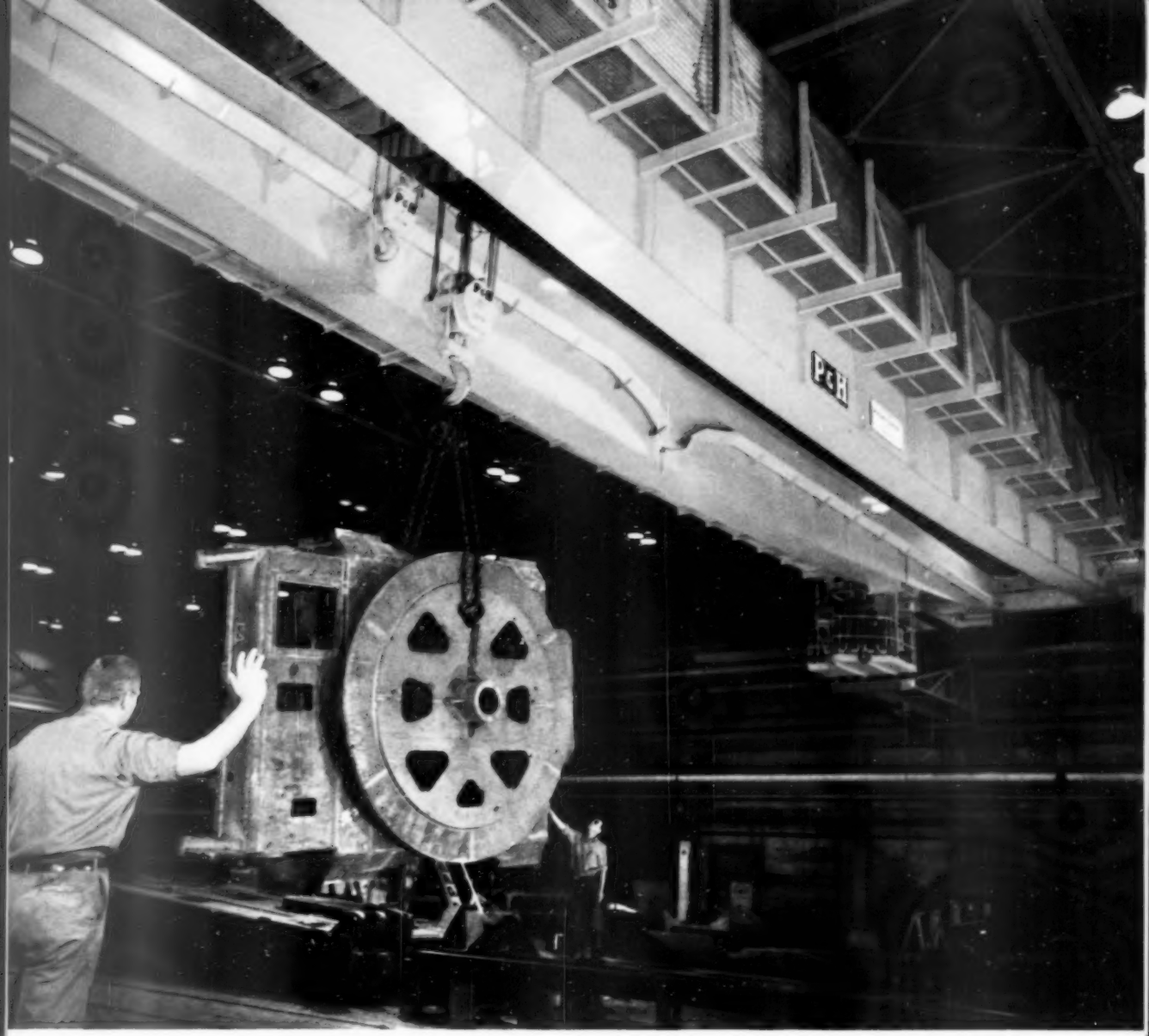
Each plant chose a relatively small town—a clear demonstration of the trend to suburbs and rural areas in plant location. And each plant maintains that it had (and has) an adequate supply of qualified candidates for most jobs. A few special skills are the exceptions.

Kaiser's problems—Kaiser is a good example of the big plant in a small rural community. The problems of the workforce loomed large enough to cause the U.S. Department of Labor to let a contract for study of what happened when Kaiser moved into Ravenswood. Some of the results of the study, conducted by Gerald Somers of the University of Wisconsin, are published in the *Monthly Labor Review* for October 1958. Even the title of that article, "Labor Recruitment in a Depressed Rural Area," suggests concern for the problem Kaiser faced.

Kaiser tells us, "One of the big problems was the public relations job of selecting only 2300 employees from 80,000 applicants." The two figures aren't as unbelievable as they look. Kaiser's big applicant pool had every kind of prospective employee in it. Many were unacceptable because they lacked experience or education, lived too far away, or had a poor work history. Kaiser was the only one of the four plants that advertised for employees.

Turn to page 200

For more facts Circle 552 on Reader Service Card
For more facts Circle 553 on Reader Service Card ➤



FOR EVERY APPLICATION, THERE'S ONE CRANE OUTSTANDING...

IN METALWORKING: Huge industrial cranes with P&H Electronic "Stepless" Control are used to handle the largest metalworking shop loads with ultra-fast speed, yet with damage-eliminating gentleness. Where duty cycles permit, smaller, moderately priced P&H cranes handle a host of lifting jobs with plenty of muscle, but low investment.

All the mechanical and electrical parts for both big and small P&H cranes are made by and warranted by P&H. We promise undivided responsibility — not a service "run-around". When we sell it, we service it — and our interest in your crane stays active as long as it is on your runway!

Isn't that the assurance you want on your next crane? Bulletin C-6, "P&H Industrial Cranes," is packed with photos and facts showing how P&H installations service *your* industry. Write Dept. 102, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

OUR 75TH YEAR

P&H HARNISCHFEGER

...quality and service for 75 years

WHEN PRECISION PRODUCTION RIDES THE HOOK...

On a crankshaft production line, even slight damage to a crankpin can mean an expensive piece of scrap — something no manufacturer can afford.

That's why this manufacturer uses *close-spotting* P&H Zip-Lifts.

Where every movement is made with hoists, a hoist breakdown means lost production — something no manufacturer wants.

That's why this manufacturer uses *dependable* P&H Zip-Lifts.

And human beings need protection — against electric shock, mechanical failure, poor construction, and other hazards.

That's why this manufacturer uses *safe* P&H Zip-Lifts.

Are *you* now using close-spotting, dependable, safe P&H Zip-Lifts — or are you one of the group of hoist users who is about to switch over to them? Capacities from 250 to 2000 lbs., your choice of mountings. Priced from $200. Write for Bulletin H-20, Dept. 201, Harnischfeger Corp., Milwaukee 46, Wisconsin.

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OUR 75TH YEAR

Eye Accidents Cost Big Money

482A
IMPACT GOGGLE

Jumbo-size, one piece, interchangeable acetate lens. Flying particles bounce right off this .050" thick lens which meets all government requirements. Soft vinylite frame fits snugly. Very flexible for comfort. Adjustable, elastic headband. Clear frame, clear or green acetate lens. FOR GREEN FRAME, clear or green lens, specify NO. 483A.

484A
CHEMICAL GOGGLE

Note louvers which provide safe indirect but ample ventilation. This typical example of AO engineering increases comfort, reduces fogging. Mask is acid and alkali-resistant to splash. Lens similar to 482A lens. FOR GREEN FRAME, clear or green lens, specify NO. 485A.

486A WELDING GOGGLE

New nylon adapter holds lenses in frame securely and will not buckle or crack in heat. Close fitting, no dangerous, stray light rays can enter. Good ventilation and fogging control from 8 louvers. Comes with Noviweld filter lenses, shades 3, 4, 5, 6. Companion model 489A for chipping and grinding has clear frame, clear transparent adapter and Super Armorplate lenses.

AO Eye Protection like this Costs Little!

An American Optical Safety Goggle costs less than the *slightest* lost time eye accident. Just one *serious* eye accident can cost one thousand times as much — and more — in direct and indirect costs! These AO 480A Series Flexible Mask Goggles offer the following advantages:

- **Light Weight**
- **Better Ventilation**
- **Optical Fidelity**
- **Wide Angle Vision**
- **Excellent fit over personal glasses**

YOUR NEAREST AO SAFETY PRODUCTS REPRESENTATIVE CAN SUPPLY YOU

American Optical
COMPANY
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Always insist on Ⓐ Trademarked Safety Products

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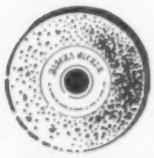
Speed work,

cut costs with B&D accessories

Every job goes faster when you use the *right* tool . . . and the accessories *built for* that tool.



GRINDING WHEELS

WIRE WHEEL BRUSHES

HAMMER TOOLS

SCREW DRIVER BITS

With over 2,000 accessories in the line, you're *always* right when you buy B&D because Black & Decker has the *right one* for every application.

So remember . . . whether your need is hammer tools, screw-driver bits, wire wheel brushes, grinding wheels, polishing pads or any other accessory for a Black & Decker tool . . . call your local Black & Decker Distributor. He stocks 'em all.

INSIST ON THE BEST

Black & Decker®

ACCESSORIES DESIGNED FOR THE TOOL

Professor Somers draws these conclusions about plant location in rural areas:

- The company cannot expect to find or attract enough professionally trained or managerial employees in the area. So it must transfer a number of key employees from other plants. For Kaiser it was no big problem. But it would have been for a single-plant company.
- The company can expect some increase in the available labor supply to result from the demand the new plant creates. But many in this group are not likely to meet the company's requirements in age, experience, education, or physical fitness.
- Unemployed workers are an important source of labor in areas like Ravenswood, but the percentage of unacceptable applicants is high.
- Most of the new plant's employees come from other local plants and businesses. They quit their previous job voluntarily—looking for advancement and higher earnings.
- Many applicants from outlying areas are willing to commute long distances and even change their residence to get the new job. (Kaiser was careful of long commutes, tried to hire within a 45-mile radius.)
- Many workers who had been forced out of the area by lack of opportunity will return to apply at the new plant. Kaiser, IBM, and Cutler-Hammer were impressed by the number of young people who wanted to get back to their home towns.

NEW HOME SELECTED

Kaiser's location was at the extreme for the Top Ten. Ravenswood is small (1000 people before Kaiser came), not near a big city, in a distinctly rural area. The remaining three towns didn't offer quite as big a recruitment challenge. Here's a quick picture of each:

- Lincoln, Ill. (pop. 14,000), is a quaint little town about 25 miles from Springfield, the state capital, and about 30 miles from Peoria and Decatur. It's on Route 66. The area is farm country, and the town's small industries tend to be centered on farm products.
- Rochester, Minn. (pop. 30,000), is best known for its famous Mayo Clinic. Presence of the Clinic gives this agricultural community a cosmopolitan atmosphere. The town is on a main highway and has an airport. It's about 50 miles from Minneapolis and St. Paul.
- Richmond, Ind. (pop. 39,000), is a small industrial town. International Harvester Company closed out an operation here just before Bucyrus-Erie came to town. So recruitment wasn't much of a problem. It's near the Ohio-Indiana border, about 60 miles from Indianapolis, 50 miles from Cincinnati.

The four plants that settled in new towns had no problem getting applicants. Kaiser had 80,000 applicants for 2300 jobs. Cutler-Hammer had 7000 applications filed for its jobs. Bucyrus-Erie and IBM, like Cutler-Hammer, found general advertising for help unnecessary. As soon as the news of the new plant appeared in the local papers, the flood started. Kaiser did advertise for help—used local papers, local radio and television stations, and the community grapevine.

MANAGEMENT MUSTERED

All Top Ten started with a basic management team from the old location or from other company units.

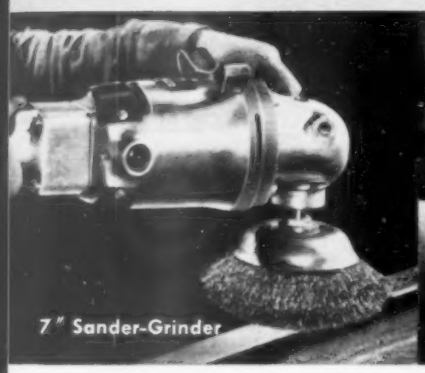
Kaiser has an especially efficient way of locating men with special skills within its far-flung empire. It has cards up its sleeve—MIDP cards ("Management Inventory and Development Program").

These are 8x10½ Keysort (Royal-McBee Corporation) cards, one for each manager in Kaiser's operational empire. On the card, and punched in the sides, is a man's personal, professional, educational, and work history. If a maintenance manager with specific qualities is needed, zip go the pins through the Keysort deck, and Kaiser's office finds him—maybe in California.

Cards made up—Where do the cards come from? From a nine-step procedure that starts all the way down the line, culminates in central staff records. Here's how supervisor John Doe's card travels:

1. Local management at John's plant (maybe in Ohio) decides who should be included in the MIDP survey. He appoints a representative to

PRODUCTION...CONSTRUCTION...MAINTENANCE


7" Sander-Grinder

No. 12 Scrugun®

No. 11 Jig Saw

whether the job's drilling, sanding, sawing,

7" Super-Service Saw

No. 88 Finishing Sander

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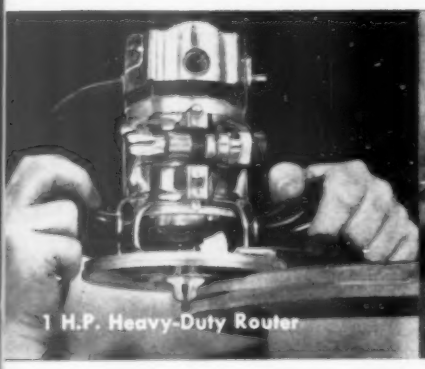
fastening, grinding, bolting, chipping...


1 H.P. Heavy-Duty Router

No. 60 Portable Grinder

3/8" Standard Holgun®

Black & Decker® tools cut your costs!

Save time whenever you need a portable electric tool . . . simply call your local Black & Decker distributor. He stocks over 125 tools and 3,000 accessories to give you complete selection, fast delivery, tool know-how and personal service. Or, for complete tool information mail coupon at right.

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Outer shell lifts easily for quick emptying

Steel body, stainless steel trim and self-closing push door. Galvanized inner container, bonderized outer shell. White, red, grey, or green baked enamel.

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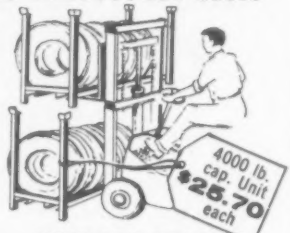
JARKE MODULAR STORAGE SYSTEMS
Increase Storage Efficiency... Save Time... Cut Costs

"MINI-MODULE" PRE-FABRICATED STORAGE RACKS
2500 lb. cap. Unit $5.67 each

Easy To Handle • Quickly Set Up Or Taken Down

For Permanent Or Temporary Storage

Jarke Mini-Modules give you storage when you want it, where you want it. Easily set up or taken down, no bolts, no tools, no fittings. Special "nesting" caps provide fast stacking and insure rigid, no-slip interlocking tiers. Sturdy steel construction. Lightweight. Four standard sizes. Send for details now!



4000 lb. cap. Unit $25.70 each

WIRE COIL RACKS

Designed for stacking coiled material, these racks have four-way entry for fork truck, open ends for ram-type deposit of coils. Nesting caps insure fast easy stacking. Heavy-duty steel construction.

Std. Unit $33.20 each

PORTABLE BAR RACKS

Unique crane grab permits load centering and rapid fool-proof engagement. Automatic grab also available. Assorted standard sizes. Specials to order.

JARKE MANUFACTURING COMPANY
6333 Howard St.
Chicago 48, Illinois

MODULAR STORAGE SYSTEMS FOR METAL INDUSTRY • STEELMOBILE

handle all details. (Figures show that 5% of the reserve pool are executives, 60% middle management, 35% first-line supervisors.)

2. All people in the program, including John, attend training classes or informal discussions.

3. John fills out personal history and position description forms. These tell his background, education, experience, nail down the description of his present job. John discusses the position description with his boss, gets his approval.

4. An appraisal committee made up of John's immediate boss, his boss's boss, and a "neutral third party" (who knows John and his work) reviews this material. Each man appraises John's performance, ability, potential. They do this separately, do not compare notes until later.

5. Next the committee meets to discuss individual and group appraisals with John. A confidential recording secretary takes down the observations. Rough copies of these appraisals made are burned.

6. The committee compiles a list of development ideas for John.

7. After John and his boss discuss the consolidated appraisal and the suggestions for John's development, a detailed development plan is put in writing by John's boss.

8. Pertinent paperwork is distributed to parties concerned. Central Management Services makes up the Keysort card from data on forms, files both for use in the event of a management opening John can fill.

9. John's records are reappraised annually (or within six months after he changes to a new job). Line managers send reappraisal data to the MIDP staff.

WORKFORCE SELECTED

Bucyrus-Erie and IBM both gave at least a basic mental abilities test to all applicants. IBM used the Wonderlic test, also tested clerical applicants for typing, shorthand, and clerical aptitude, depending on the job. But the company maintains that the interview was still the main basis for hiring.

Bucyrus-Erie did a thorough job. It used a battery of tests in evaluat-

FLAMMABLES ENGINEERING BY PROTECTOSEAL

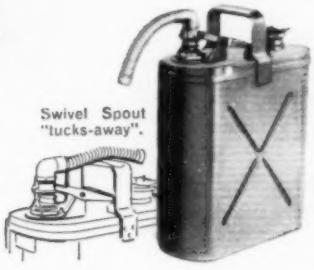
FLAMMABLES CONTROL METHODS AND PRACTICES IN PRODUCTION, PROCESSING AND IN MAINTENANCE

PUBLISHED BY THE PROTECTOSEAL COMPANY, CHICAGO, ILLINOIS • WAREHOUSES: CAMDEN, N. J.; LOS ANGELES, CALIF.

BENCH PARTS WASHER...

. . . with portable parts basket speeds cleaning small parts—keeps worker's hands out of solvent. Fire baffle-dasher stops fire, reduces vapors.

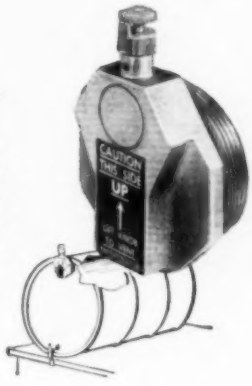
Coupon No. 25



SPACE-SAVING SAFETY CAN

Oval shape requires minimum storage space, permits natural, close-to-body carrying. Flexible spout safely speeds dispensing—no spillage. 5-gal. capacity.

Coupon No. 15



SAFETY DRUM VENT FOR END-BUNGS

Fire-explosion safe flame arrester vent designed to fit end-bung openings of drums stored horizontally. Stops leaks. Provides pressure-vacuum relief.

Coupon No. 16

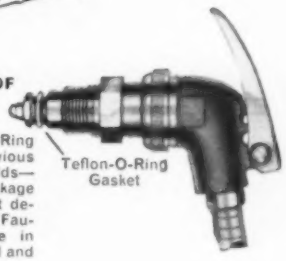
NEW DEVELOPMENTS IN FLAMMABLE LIQUIDS SAFETY

New developments in the safe, productive use of hazardous liquids occur frequently. Often, these developments result from the needs of a single Protectoseal user—needs for which adequate safeguards did not previously exist. When these developments can be applied to operations in other plants, they are made available. The examples here are the most recent.

AUTOMATIC MASK WASHER

Safely, automatically washes paint-clogged spray masks in solvent. Uses any compressed air supply. Leaves worker free for production spraying. Fire-safe.

Coupon No. 26



LEAK-PROOF SAFETY FAUCET

New Teflon O-Ring gasket impervious to most liquids—prevents leakage due to gasket deterioration. Faucets available in stainless steel and brass.

Coupon No. 17

FLAMMABLES STORAGE CABINET

Approved now by N.F.P.A.; Board of Standards & Appeals, City of New York; Penna. State Police Bureau of Fire Protection—for storage of up to 45 gals.

Coupon No. 19

TILT-TYPE SAFETY CANS

Now available with space-saving wall bracket. Cans tilt easily to correct position for dispensing; swing back to upright position after use.

Coupon No. 22

Use coupon for complete information

VISCOUS LIQUIDS SAFETY CAN

For storing, dispensing liquids such as rubber cement. "Knife-like" closure blade over spout stops flow of liquid with clean "cutting" action—no sloppage.

Coupon No. 20

SAFETY DRUM PUMP

Designed for flammable liquids—now made equally efficient for light oils. No safety supervision problems—use a single pump for flammables as well as non-flammables.

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DATA OF INTEREST AND VALUE TO PLANT MANAGEMENT

Send Further Information On Items Checked Below:

15 16 17 19 20 21 22 25 26

☐ Send Entire File Of New Developments In Safety

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THE PROTECTOSEAL COMPANY
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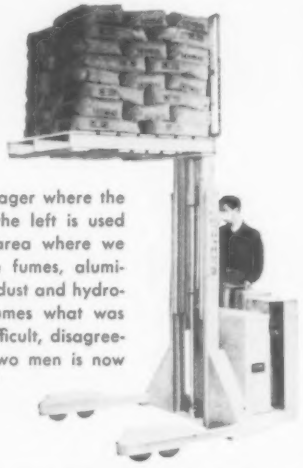
EXPLOSION PROOF
CLASS I GROUP D
POWERED LIFT TRUCKS

Underwriters' Laboratories, Inc. INSPECTED TYPE EX REVOLVATOR COMPANY

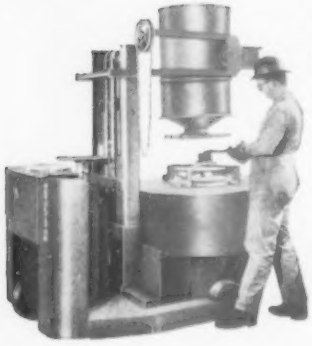
APPROVED and PROVEN

8 YEARS ON THE JOB

Since 1951 Revolvator Go-Getters, designed for this service, have been specifically approved by leading industrial insurance companies for use in Class I Group D explosion hazardous areas in major plants from coast to coast. User comments like those below show that the Go-Getter has been more than approved by safety authorities . . . it has been proven in use for eight years.

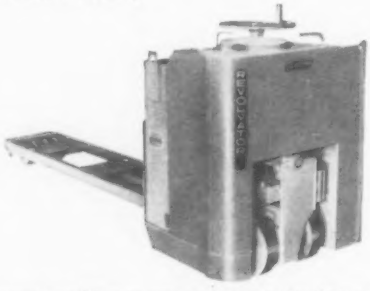


The Plant Manager where the Go-Getter at the left is used says, "In an area where we have explosive fumes, aluminum choloride dust and hydrochloric acid fumes what was previously a difficult, disagreeable job for two men is now easy for one."



Air in the color mixing room of the finishing plant where the Go-Getter above is used carries organic dusts as well as explosive fumes. The foreman says, "The men like the Go-Getter and use it steadily."

Executives in the chemical plant where the model to the right is used say, "We use the Go-Getter in our area which has the most severe hazard." Another plant where quantities of explosive solvents are used for "wash down" reports of a similar model, "We are well pleased and we are ordering another Go-Getter."



A major insurance association writes, "We are quite willing to accept the unit (Go-Getter) as it is designed with explosion proof housings for the motors and controls as usually specified for electrical equipment that can be safely used in explosion hazardous areas."

A nationally known safety engineer writes, " . . . calling the existence of this line of trucks to the attention of the industry as we believe many would want to know about this equipment."

The Go-Getter is the latest addition to a complete line of materials handling equipment for use in explosion hazardous areas that Revolvator has been building for over a quarter of a century.

REVOLVATOR CO.
8761 TONNELE AVENUE, NORTH BERGEN, N. J.
SINCE 1904

STAFFING THE TOP TEN
Begins on page 194

ing every applicant. The battery varied with the job in question. The minimum battery took two hours of the applicant's time. Mental alertness, personality characteristics, and the man's aptitude for the job were tested in every case.

The remaining plants selected new employees on the basis of interview alone. They took education and work history into consideration.

TRAINING MADE BETTER

Of the four long-distance movers, IBM-Rochester is the prize-winner when judged on the basis of employee training. The other plants turned mostly to on-the-job training to help new employees.

Here's a sample of what IBM did:

Maintenance men—Most took a 346-hour course. About half of this classroom time was spent at Dunwoody Industrial Institute (in Minneapolis). The remainder was conducted by IBM people.

Machinists—Approximately 12% of the machinists in the plant were transferred from other locations. Another 62% were hired locally, then sent to one of IBM's eastern plants for one year's training. The rest were trained at the plant.

Assemblers—Of all the plant's initial assemblers, 60% had from three weeks' to three months' training at the company's plant in Endicott, N. Y. Some of these men have since been upgraded, but all are still affiliated with assembly.

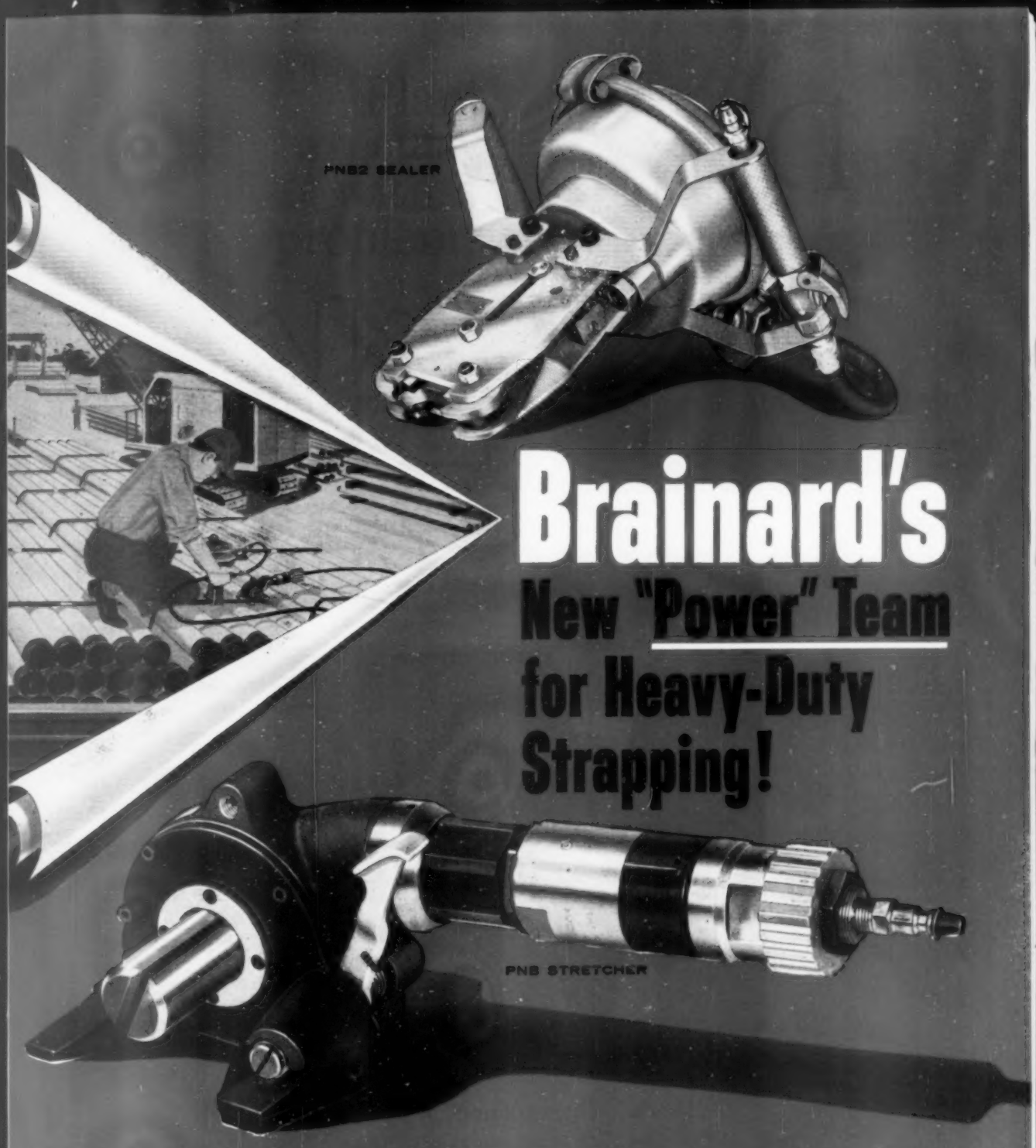
Plant guards—They received a 13-hour course in fire prevention and fire fighting.

Inside truckers—The company has a large group of them. And 160 men have taken a 10-hour course, given by IBM men who attended a training program given by Yale & Towne in Philadelphia.

Secretarial and clerical—The program for office people is a 22-hour affair. It has been attended by 120 employees. And a special shorthand course—111 hours long—was conducted for 12 employees.

Management—All first-line managers have had from 68 to 90 hours of basic management training. Higher managers have had about 32 additional training hours. **END**

For more facts Circle 559 on Reader Service Card
For more facts Circle 560 on Reader Service Card ➤



Brainard's New "Power" Team for Heavy-Duty Strapping!

Two more new heavy-duty power tools added to Brainard's rapidly growing strapping system—the exclusive PNB stretcher and the PNB2 sealer—give even more cost-cutting advantages to heavy-duty strapping users everywhere.

The PNB pneumatic stretcher permits quick tensioning—automatically—and maintains it. Then the PNB2 pneumatic sealer, with a simple press of the thumb, gives a strong, safe, lasting seal.

Both tools working as a team assure you of fast, efficient heavy-duty strapping on 2" x .050 size on many types of carloading and packaging. Particularly adaptable to carloading of pipe as illustrated.

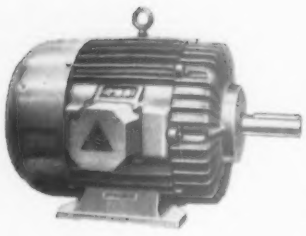
Why continue with obsolete, time-consuming equipment? Get in touch with your Brainard representative for details and prices.

BRAINARD Safe-Ty **STRAPPING**

DIVISION OF SHARON STEEL CORP. • WARREN, OHIO

Delco delivery

TIME



Delco Delivery Time

How does this fit in with your production schedule! Delco Products offers from in-stock to three weeks delivery on integral h.p. polyphase motors. This includes rerated 182 through 445U frame sizes. In many cases overnight delivery is available! A modern assembly system, geared to your needs, makes this type of quick delivery possible. Now you can be sure of faster delivery, plus the quality and performance for which Delco Motors are famous. Always call Delco Products for the best possible motor in the least possible time.

DELCO MOTORS

Delco Products, Division of General Motors, Dayton, Ohio
Branch Offices in Principal Cities

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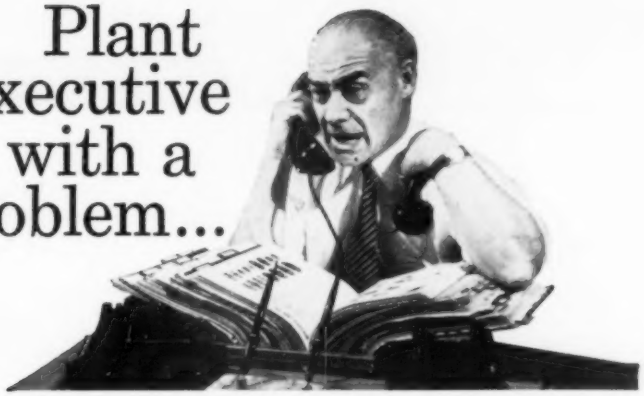
Plant executive with a problem...



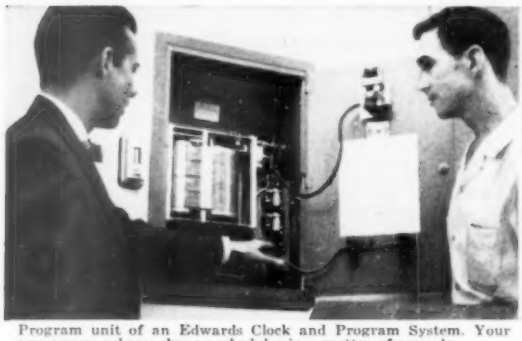
Edwards modern signaling systems can make him smile again!

If it's an industrial control, communication or protection problem, better days are on the way! All he has to do is hang up one of those phones and call his nearest Edwards electrical distributor. It makes sense to check the advantages inexpensive Edwards signaling systems provide industrial plants in efficiency, safety, and maintenance savings. And there's no better time to do it than plant modernization time. Why not call *your* Edwards distributor today. He will be glad to survey your plant and recommend the signaling products that can best solve your own particular problems, and make your plant a safer, more efficient, more economical operation. His services are fully backed by Edwards technical representatives in all major cities.

And while you're at it, ask him for your copy of the Edwards Industrial Signaling Log–a concise, informative booklet covering all aspects of industrial signaling products and what they can do for you.

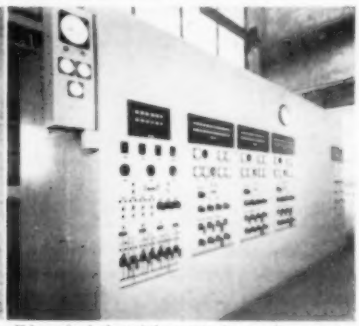
Strategically located manual coded stations combined with ceiling-mounted, automatic fire detectors provide 24 hour protection.

LOKATOR master selector unit – installed convenient to regular switchboard for ease in paging key personnel.



Program unit of an Edwards Clock and Program System. Your own personnel can change schedules in a matter of seconds.

Industrial chime for plant paging, installed below Edwards clock.



Edwards industrial annunciators in power plant, with remote reset feature.

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FACTORY CATALOG NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

MECHANICAL

1—Conveyor Drives. Bulletin A667C, 16 pages, describes compact screw conveyor drive complete with speed reducer packing gland and drive shaft, which mount as a unit on a trough end. Four sizes for most applications. *Dodge Mfg. Co.*

2—V-Belt Fasteners. Here's a 6-page bulletin (No. V-227) that discusses how V-belts can be made to any length with fasteners. One strong joint permits fast and easy installation on all types of drives. *Flexible Steel Lacing Co.*

3—Bearing Units. Take-up units that combine advantages of modern anti-friction bearings with "unbreakable" malleable housing are discussed in 16-page catalog (BU-101-B). Includes construction and other data. *Browning Mfg. Co.*

4—Sprockets. Catalog 100B has 20 pages of info about flexible couplings and sprockets for roller chains. Mounting and dismounting instructions are given, plus dimensions and other engineering data. Photographs. *Acme Chain Corp.*

5—Speed Reducers. Engineering info and specs are contained in illustrated Bulletin 5908 (16 pages) for SpeedMaster line of vertical-helical reducers. Selection instructions cover many types of installations. *Western Gear Corp.*

6—Electro-Sheaves. This 10-page catalog describes new clutch-pulley package for direct installation on standard electric motors from 1 to 25 hp. Includes helpful sections on operation, dimensions, and selection. Illustrated. *Warner Electric Brake & Clutch Co.*

7—Valves. Over 200 solenoid valves of bronze and stainless steel construction are listed in this 36-page catalog (No. 444). Valves may be used for air, steam, corrosive and non-corrosive gases, and liquids. *Atkomatic Valve Co.*

8—Pipes. Here's a 24-pager that explains how Duplex Tubes help solve corrosion problems in condenser and heat exchanger equipment. Interior and exterior of tubes can be fabricated from metal suited to needs. *Bridgeport Brass Co.*

9—Seal Valves. Single piston-type hydraulic operating valves are described in 20-page Reference Book 39-6. Feature of valves is that same line pressure acts both inside and outside U cup seals at all times. *Homestead Valve Mfg. Co.*

10—Valves. Two catalogs: No. J-1160 (4 pages) has info on sliding gate pilot-operated pressure reducing valve; cutaway drawing, photos. No. JF-49 (double page) covers loading valves; gives dimensions, other data. *OPW-Jordan.*

MAINTENANCE

11—Seals. Here's a Fact Book that tells how to select and install quad-ring and O-ring seals, and Kapseals. The 24-pager includes size numbers, dimensions, specs, UL-approved rubber compounds, other data. *Minnesota Rubber Co.*

12—Maintenance Equipment. High-speed rotary files, mica undercutters, field coil-testers, other equipment are presented in 60-page ready-reference guide (Catalog No. 32). Includes how-to-use-it photos. *Martindale Electric Co.*

13—Industrial Monkey. This 8-page folder describes new model mounted on a 16,000-lb., or heavier, truck chassis that's completely maneuverable. Average working height is 48 ft. Working ranges and load capacities, photos. *Peters Co.*

14—Gaskets. Bulletin AD-104 details features of metal gaskets and lists various types for special applications. Charts give recommended sizes; specs cover round, oval, square, flat side, pear-shaped gaskets. *The Garlock Packing Co.*

15—Fire Extinguishers. This 6-page folder is titled "A Guide to Fire Extinguishers." Table compares characteristics of various types of extinguishers; a graph compares effectiveness of extinguishing agents. *Ansul Chemical Co.*

PRODUCTION

16—Auto-Tracer Lathes. Form CO5810 has 8 pages on machines' automatic tracing cycles, variable components available, design features, and specs. Explains controls for quick setup and operation. *Jones & Lamson Machine Co.*

17—Milling Control System. Here's a 6-page bulletin (No. STM-1) that discusses cost-saving features of Synchro-Trace, the fully automatic 3D programed control system for milling applications. Illustrated. *True-Trace Sales Corp.*

18—Electric Tool. New ½-in. drive heavy-duty electric Impactool, size 5U-HD, is presented in 4-pager (Form PL-5252). Delivers 1900 impacts per minute, runs at about 1900 rpm. *Ingersoll-Rand.*

19—Gages. Here's a 16-pager (59A) on three new gages: miniature OD grinding gage for diameters below ½ in., king size OD gage for diameters over 20 in., gage for continuously measuring inside diameters. *Federal Products Corp.*

20—Welding Positioners. This 16-page bulletin (P-28) presents nine heavy-duty models from 3000- to 100,000-lb. capacity. Describes new features and accessories for greater range, precision, ease in handling. *Harnischfeger Corp.*

21—Instantaneous Heating. Technical Bulletin 209 (48 pages) describes new luminous wall combustion system for gas-fired, infrared heat-treating furnaces. Tells what the luminous wall is, how it works, etc. *The A. F. Holden Co.*

Turn the page

Fast new Signode heavy-duty tool

at least
Saves this much strapping

every time it's used

The FN-114 is the first air power feed wheel heavy-duty tensioning tool. It is fast and easy to use. In addition to saving time, it eliminates waste in the curl of strap which, until now, has been a necessary evil in applying 1¼-inch strapping with windlass type tools.

Additional savings come from the fact that the FN-114 takes strapping directly from the dispenser—takes out all the slack *before* the strapping is cut off by a quick stroke of the handle.

The FN-114—like other Signode heavy-duty tools—is available on an annual rental or single payment basis. Let us arrange a demonstration on your premises at your convenience. Just write or call. No obligation.

Air power tensions 1¼" strapping fast, pulls as much as 3000 pounds of pre-set tension every time. Feed wheel permits unlimited take-up of slack.

The powerful FN-114 holds the tension in the strapping while the operator applies the seal, using a Signode Model C tool. Signode heavy duty air-powered sealers are also available.

New 1¼" seal has open flange to permit fast, easy placement. This seal or regular thread-on seal can be lithographed with your company name, trademark, and colors.

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22—Chucks. Mechanical features and complete specs on each of 59 chucks are contained in 14-page catalog. Has info on other tools, including chuck keys, arbors, chuck repair parts, portable drill attachments. *Supreme Products Corp.*

23—Unit Tooling. Special adaptations and variations possible in the field of unit tooling are discussed in an illustrated 8-pager. Shows some of the many shaped punches and dies that can be produced quickly. *Tool Products Corp.*

24—Spindle Machines. Catalog A-24-S (8 pages) discusses faster finishing of such complex components as gears, bearing cages, pump rotors, etc. Describes in-line production, has photos of "before and after" finishing. *King-Seeley Corp.*

25—Tracer Control. Bulletin GEA-6122 (8 pages) describes tracer control systems for variety of metal-working applications. These include vertical boring mills, skin milling machines, center-drive and turret lathes. *General Electric Co.*

MATERIALS HANDLING

26—Handling Equipment. New condensed catalog (No. 591, 68 pages) presents information on vibrators, car shakers, rappers, feeders, conveyors, and other equipment. Includes specs; illustrations show applications. *Syntron Co.*

27—Conveyor Belt Splice. This 4-pager (Form No. M380) describes a new method for splicing conveyor and elevator belts. The Wedlok, a high-tension mechanical fastener, eliminates field vulcanizing. *Raybestos-Manhattan, Inc.*

28—Electric Trucks. Specifications and capacity data for six types of trucks are given in illustrated Catalog B-611 (12 pages). Describes major truck components; lists fork-lift attachments. *The Elwell-Parker Electric Co.*

29—Hoists. Bulletin No. 920 (12 pages) describes line of Type F, low-headroom electric hoists. Available in four frame sizes with capacities that range from ½ to 10 tons. Includes construction, performance data. *Robbins & Myers, Inc.*

30—Handling Systems. Here's a 10-pager, "Performance Briefs," that gives solutions to materials handling problems through use of Hydro-Arc electric furnace, cranes, overhead handling systems, etc. Application photos. *Whiting Corp.*

31—Trucks, Casters. Junior Catalog 59G (12 pages) gives specs for 44 models of two-wheel trucks, 12 types of dollies, 4 wagon trucks, many styles of casters, other equipment. Dimensional tables, photos. *Nutting Truck & Caster Co.*

32—Pneumatic Conveying System. Here's an illustrated 4-page bulletin (No. 211) that describes a "complete package unit." This unit combines negative and positive pressure systems designed for both small and medium-size needs. *Sprout, Waldron & Co., Inc.*

33—Automatic Packaging. This 6-page fold-out catalog (Form 100-54A) discusses completely automatic packaging production line. Drawings show operation of single- and multiple-tier case loaders, other machines. *J. L. Ferguson Co.*

34—Handling Techniques. How to keep your production rolling smoothly and how to provide flexibility in indoor and outdoor materials handling activities are outlined in Job Study No. 193. Covers new mechanized units. *Towmotor Corp.*

35—Weight Recording. Transmitting and processing of weight data are described in 8-page catalog (Form 2975a). Systems using Direct Digital Scanner are discussed, also latest advances in remote weight recording. *Toledo Scale Corp.*

36—Packaging Guide. "How to Pack It" includes helpful information on the selection of proper corrugated packaging for products. The 32-page revised booklet describes various styles of boxes, including slotted, telescope, others—56 in all. *Hinde & Dauch.*

37—Crane Equipment. Design, operation, and performance details of electric and electronic equipment are set forth in Bulletin C5-2 (32 pages). Includes speed-load curves for all crane motions, photos. *Harnischfeger Corp.*

INSTRUMENTS AND CONTROLS

38—Instruments for Rent. Bulletin GEA6829 (8 pages) describes new instrument rental service. Describes scope of program and the types of products included in the 13,000 that can be rented. Photographs. *General Electric Co.*

39—Magnetic Tape Recorders. Specs and other technical data are given in 8-page brochure (No. 55). Transistorized electronics and unique magazine loading feature are combined to produce a 7-channel recorder/reproducer weighing only 65 lb. *Precision Instrument Co.*

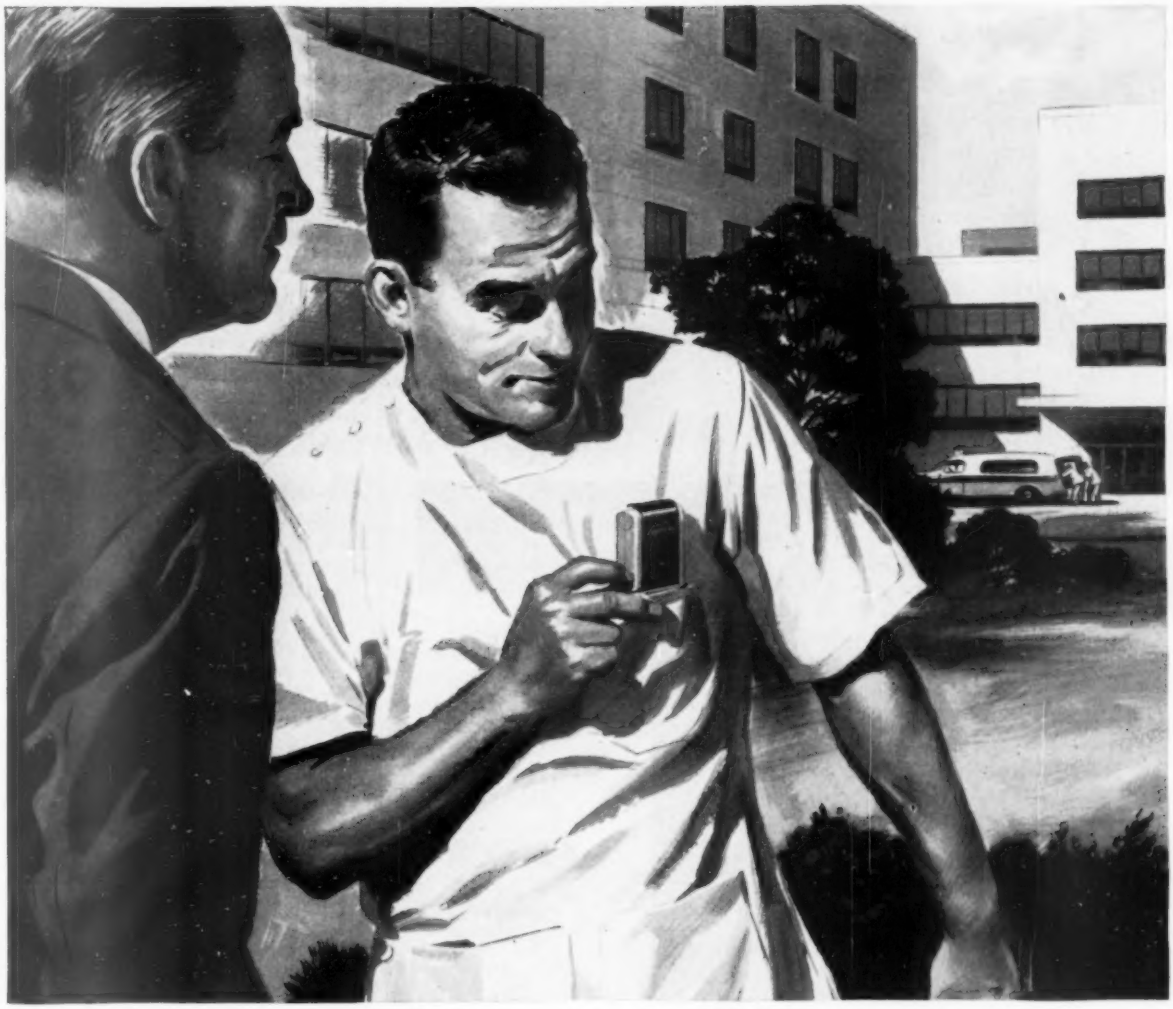
40—Level and Flow Controls. This 24-pager (ERS-A) tells how to provide operating and safety controls for a variety of applications involving liquid level and liquid flow controls. Includes 21 case studies. *McDonnell & Miller, Inc.*

AIR HANDLING

41—Truck Air Conditioning. How the Kab Kooler keeps truck cabs comfortable is explained in 4-page catalog (Form F-107). The self-powered, self-contained air conditioners can be used on many types of cabs. *D. W. Onan & Sons, Inc.*

42—Air Cleaners. This 16-pager (No. 258A) tells about new high-velocity Electro-Cell electronic air cleaners. Describes principle of operation, collector cell construction. Specs, shipping weights, capacities, and dimensions. *American Air Filter Co., Inc.*

43—Air Diffusion Equipment. Catalog No. 1-59 (58 pages) gives data on company's entire line. Info about removable core grilles with



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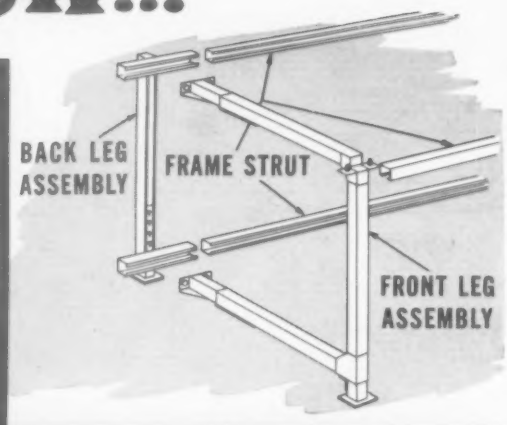

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Free your layout planning from conventional bench limitations. Develop the layout to solve *your* problems of space, time and motion economy... and set it up with standard Product-A-Flow catalog parts. It's easy! Three types of telescoping members frame any configuration and form many modular accessories. Other modular accessories include shelving, lighting, conveyors, circuitry, piping...and there are drawers, pocketbook holders, etc. All elements positioned where wanted.

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separable frames; color key for fast identification of major products. *Waterloo Register Co., Inc.*

44—Air Cleaner. Here's an 8-pager (EMC1057) that describes Type HV electronic air cleaner. Points out its high efficiency, velocities, frameless construction, low-cost maintenance, other features. Photos, diagrams. *Air-Maze Corp.*

45—Dehumidifiers. Principles and applications of blow-through sprayed coil units are covered in 24-pager (No. 9427). Said to be first complete catalog dealing with blow-through design. *Industrial Div., American-Standard.*

46—Induced Draft Fans. Bulletin L-3 (16 pages) describes advantages of these fans—long life, fuel savings, quiet operation. Details include dimensional drawings, charts of ratings, specs. *Lehigh Fan & Blower Div., Fuller Co.*

ELECTRICAL

47—Condulets. Bulletin No. 2699 (16 pages) is titled "Condulets for Corrosive Locations." Discusses equipment for use under conditions that cause corrosion. Tables list properties of various metals and finishes. *Crouse-Hinds Co.*

48—Speed Drive Equipment. Couplings, drives, brakes, dynamometers are described in illustrated Bulletin No. GB-3 (16 pages). Discusses principles on which equipment operates and gives variety of applications. *Eaton Mfg. Co.*

49—Adjustable Speed Drive. This 6-pager (No. 2750) presents a drive suitable for continuous operation at full load in ranges as high as 34:1 and for intermittent use from zero to full speed. Schematic drawings. *The Louis Allis Co.*

50—Helical Gear-Motors. New line of gear-motors designed to give dependable packaged power trans-

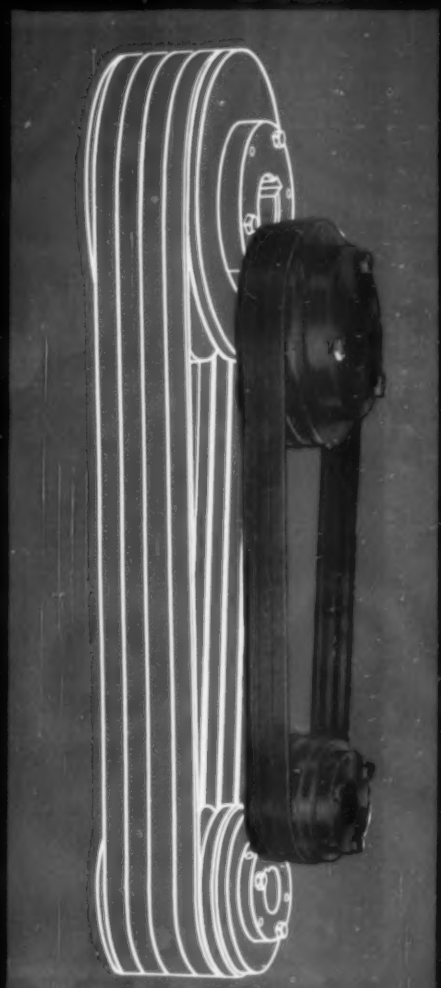
Now . . . from Durkee-Atwood

DA 358 V-BELTS

Introducing the entirely new V-Belt concept for compact, Plus-Power Drives

From Durkee-Atwood, pioneer manufacturer of high quality V-Belts for industry, comes the great new "DA 358" V-Belt, opening up completely new opportunities for highly compact, economical multiple V-Belt drives. "DA 358" V-Belts are engineered for unprecedented power transmission as compared with conventional V-Belts . . . with the ability to transmit more horsepower in a given area, at less cost, and with fewer belts, smaller, lighter sheaves and shorter center distances. They are manufactured with the quality and precision for which Durkee-Atwood is famous—quality which *we invite you to test.* Manufactured in 3V, 5V and 8V sizes.

SPECIAL: Durkee-Atwood's new "Red Shield" V-Belts now have a ***horsepower rating 40 per cent higher than former Standard V-Belts***— part of a major V-Belt upgrading program for improved drive design.



"DA 358" V-BELT drive superimposed over a conventional V-Belt drive of the same capacity illustrates the dramatic savings in space, offering new possibilities in more economical machine design.

We invite you to test DA 358 V-Belt against all other V-Belts

Write on your letterhead giving data, and we will forward to you our engineering recommendations.

Write

DURKEE-ATWOOD COMPANY

MINNEAPOLIS 13, MINNESOTA

Look for the DA *on your V-Belts*

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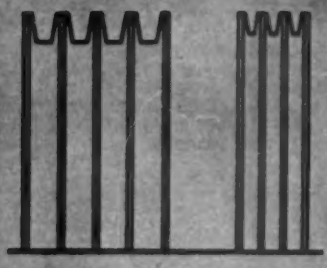

SHEAVE WIDTHS are sharply reduced with a "DA 358" V-Belt drive. Figure at left shows sheave width for a conventional drive. Figure at right is sheave width for a comparable "DA 358" V-Belt drive.

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mission is discussed in 4-color 16-pager (GEA-6704). Photos show construction details, interchangeable components. *General Electric Co.*

51—Circuit Breaker Control. Compact, rugged, and economical motor-operator that opens, closes, or re-sets molded case circuit breakers is shown in 4-pager (No. 5047-1A). *I-T-E Circuit Breaker Co.*

52—Distribution Equipment. Here's an 84-page Buy Log (GEC-1100) that helps you find application, selection, and ordering info quickly. Has selector charts for each product; pictures, ratings, dimensions, other data. *General Electric Co.*

53—Conduit, Fittings. Bulletin No. 485 is a 46-page handbook covering conduit and fittings. Shows installations, includes standard symbols and abbreviations, ASA specs. *The National Supply Co.*

MISCELLANEOUS

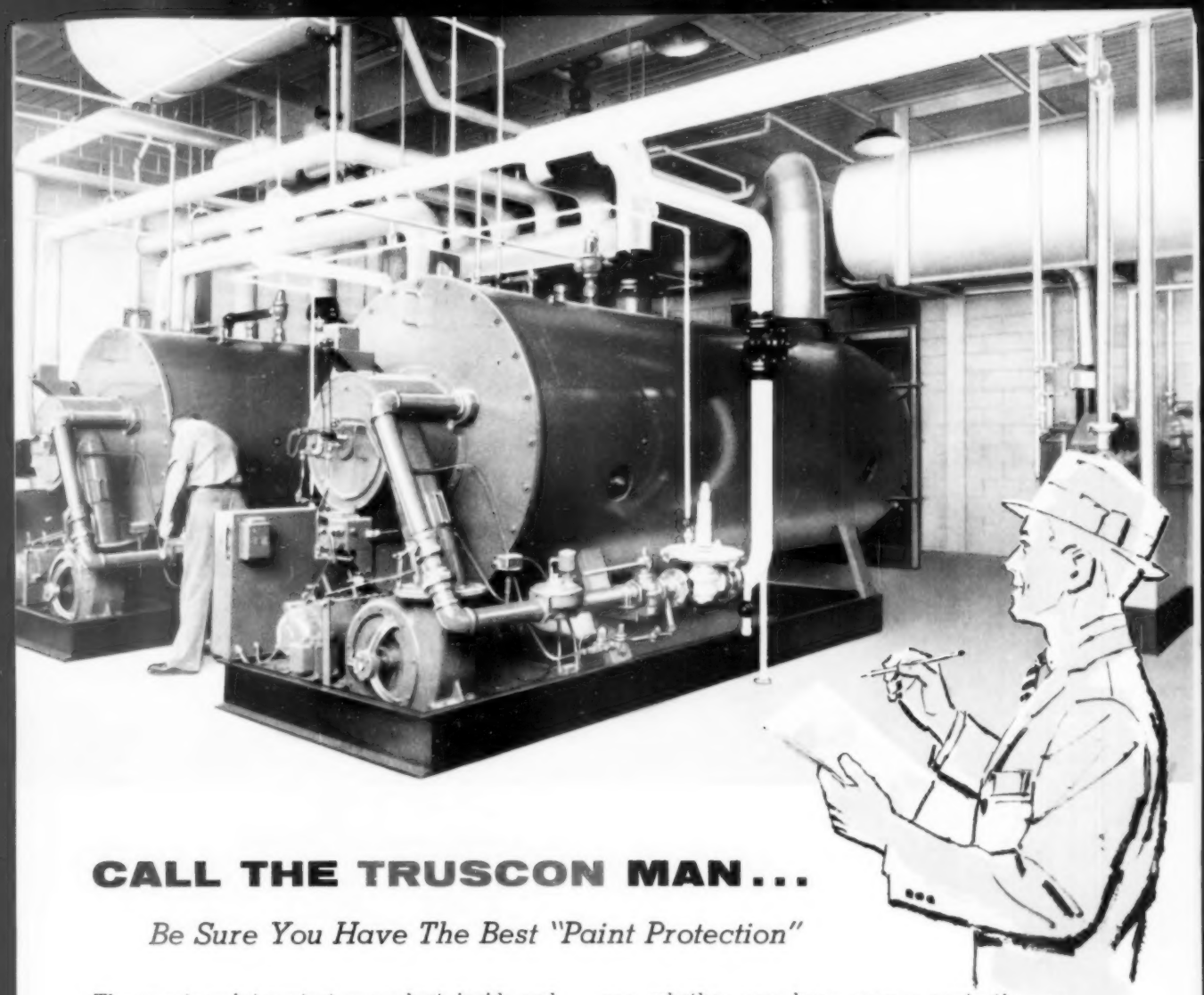
54—Elevated Flooring. This 12-pager describes Eleflor, an elevated aluminum flooring for computer rooms, other business-machine areas. Info on supporting structure, adjustable heights. Specs, diagrams, photos. *Liskey Aluminum, Inc.*

55—Rolling Steel Doors. Can rolling steel doors help make production operations safer? Answers to this, and other facts, are given in manual-guide (G-59). Includes tables of dimensions for 16 different-type doors. *The R. C. Mahon Co.*

56—Setting Floor Brick. "The narrower the joints between bricks, the better the floor" is the subject of 4-page Bulletin E27B. Explains how method produces narrow, tight joints. Specs, other technical data. *The Master Builders Co.*

57—Rolling Doors. Advantages of interlocking slat steel rolling doors are described in Catalog 101 (36

Turn to page 218



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The way to paint-protect your plant, inside and out, at the lowest cost is to use the paint that stays on *longest*. You get maximum economy and maximum protection. Fact.

The paint that stays on longest is the paint that's formulated for specific surfaces under conditions that exist in your plant. There is no one type of paint that is good for all surfaces. Apply one type of paint on all surfaces and you get short-term protection at high cost. False economy.

Call the Truscon man. He'll survey your entire plant — interior and exterior — and give you a detailed report in writing. It will show you whether you have proper protection or whether you're in danger. Absolutely no obligation on your part.

Truscon has been solving industry's paint-protection problems for 50 years. All over the world. Names of well-protected Truscon customers will be sent you on request.

Whatever the surface, whatever the conditions, Truscon formulates protective coatings that insure longer plant life for you. See the Yellow Pages of your telephone directory for the Truscon factory branch nearest you. Or write Truscon Laboratories, 1700 Caniff Street, Detroit 11, Michigan.

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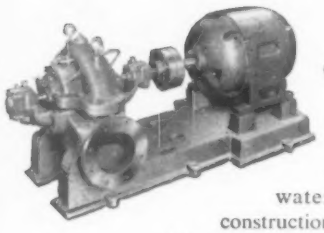
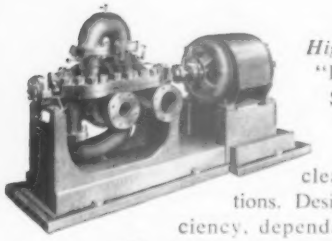
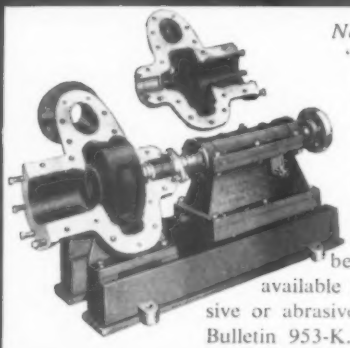


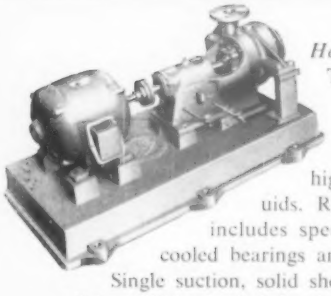
Clear Water Pumps: "Buffalo" Double Suction Pumps assure maximum efficiency in clear water service. Rugged construction provides long life with minimum maintenance. 10 to 14,000 gpm capacities. Write for Bulletin 955-R.



High Pressure Pumps: "Buffalo" Multi-Stage Pumps are ideal for boiler feed and other clear water applications. Designed for top efficiency, dependability, long life. These husky pumps operate against heads as high as 1500 ft., in capacities to 900 gpm. Write today for Bulletin 980-D.



Non-Clogging Pumps: "Buffalo" Diagonally Split-Shell Pumps are specially designed for moving high consistency liquids. Down-time, wear and wedging are reduced. Rubber-lined models are available for pumping corrosive or abrasive liquids. Write for Bulletin 953-K.



Heat Transfer Pumps: These special "Buffalo" pumps are engineered for handling high-temperature liquids. Rugged construction includes special alloys, water-cooled bearings and special packing. Single suction, solid shell design is highly efficient. Write for full details.

Chemical Liquid Pumps: These special "Buffalo" Pumps are engineered for severe service in handling most corrosive, abrasive or high consistency liquids. Ten special types are available in a variety of trim. Write for Bulletin 982-A.

NOT TO INSTALL "BUFFALO" PUMPS?

How "Buffalo" Pumps Can Save You Money Right Away: "Buffalo" offers a broad line of pumps. This means you can usually choose the right pump to fill almost every liquid-moving need. With "Buffalo" Pumps you pay only for the type, size and capacity required — no more. This often means substantially lower initial cost.

How "Buffalo" Pumps Can Save You Money Over the Years: "Buffalo" Pumps are engineered for peak hydraulic efficiency. This gives you consistently lower pumping costs. "Buffalo" Pumps are ruggedly built throughout. Extra heavy-duty components reduce maintenance costs over a longer productive life span. "Buffalo" Pumps are designed for quick, easy access to inner parts. Thus routine maintenance costs are lower. "Buffalo" Pumps feature parts interchangeability. This means further savings in reduced parts inventories.

Your nearby "Buffalo" Engineering Representative will be glad to help you choose the pumps that will most economically fill your needs. Phone him today, or write us direct.

"Buffalo" PUMPS

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A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

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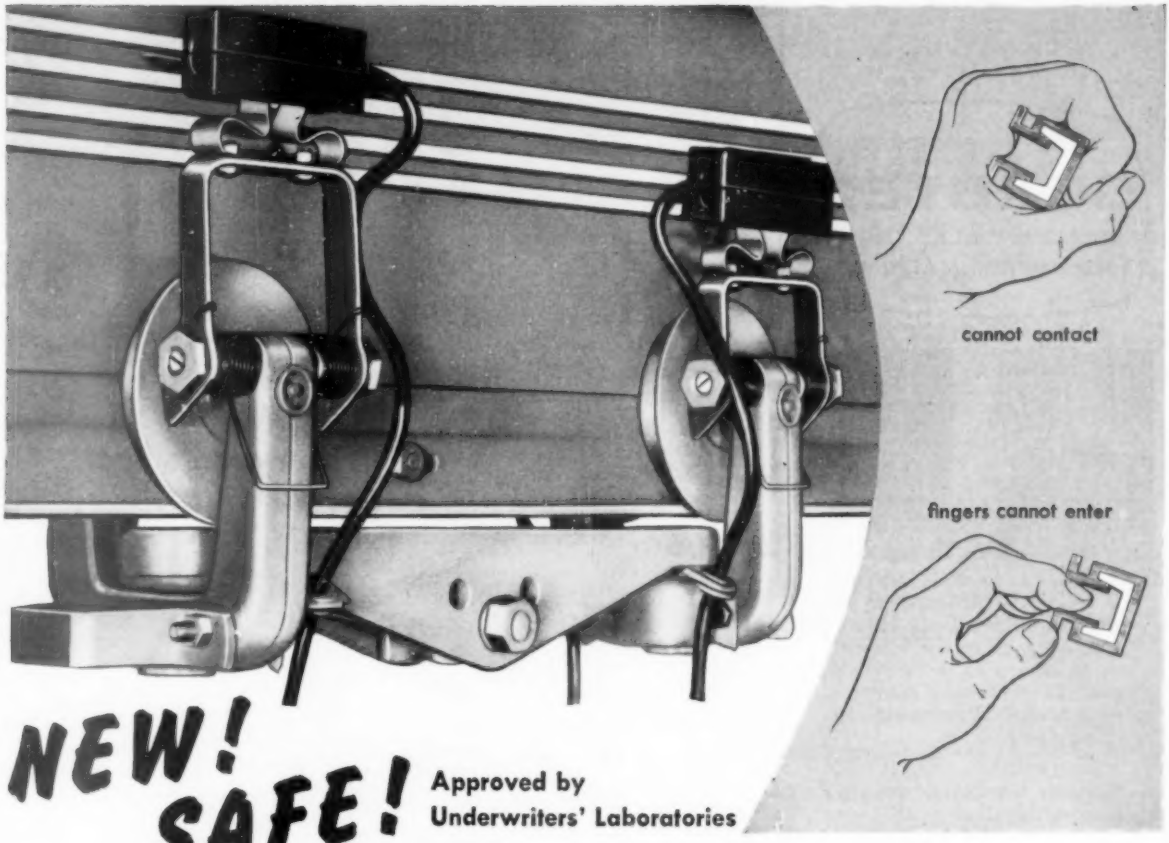

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AMERICAN MONORAIL

KANT SHOCK

SHIELDED ELECTRIFICATION

For Monorail Track and Crane Systems

By covering its standard bus bar electrification with a specially designed polyvinyl chloride extrusion, American MonoRail now furnishes completely safe electrified systems.

This KANT-SHOCK shielding absolutely prevents accidental contact with live bus bars. It is impossible for an adult's finger to enter the shield.

A new type sliding shoe collector provides a floating contact throughout a monorail system regardless of any misalignment due to bent bars or at switch and inter-lock connections.

KANT-SHOCK Electrification positively eliminates all the hazards of open bar conductors — prevents costly accidents — protects employees — reduces insurance rates.

Write for KANT-SHOCK Bulletin KS-1

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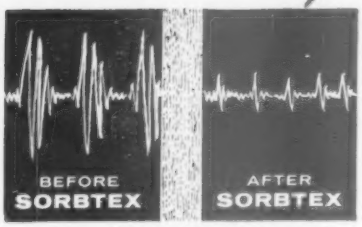

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FACTORY / CATALOG NEWS

Begins on page 208

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pages). Includes specs, dimensions, drawings of construction features, index to door types, equipment. *The Kinnear Mfg. Co.*

58—Record Files. Illustrated 8-pager (AD518) tells how to save filing space, access time, equipment costs. From one to 30 drawings, tracings, prints, or maps can be stored in each 2½-in.-square interlock file. *Hamilton Mfg. Co.*

59—Dictating-Transcribing. "How to Measure Time With Tape" (DR, 2 pages) points out advantages of the use of magnetic tape dictation over disk and belt stylus methods. Photos. *DeJur-Amsco Corp.*

60—Computers. Catalog S-463 (6 pages) is titled "New Concepts in Practical Automation and Electronic Computers." Discusses recording, distributing, summarizing, and reporting of a modern company's activities. *Royal McBee Corp.*

61—Drafting Equipment. Here's a 100-page catalog on drafting-room furniture, drawing instruments, copying machines, paper. Also tells about 120 time-saving clear plastic templates. *Alfred Mossner Co.*

62—Adhesive Equipment. Over 175 glue guns and accessory units are presented in 6-page brochure (No. G-0359). Tells how precise amount of adhesive can be placed exactly where needed quickly and without waste. *John P. Fox Co.*

63—Loudspeaker Baffles. This 64-pager describes standard baffle models for recessed, surface, suspension wall or ceiling installations, and special models. Discusses acoustical principles. Shows styles, sizes, photos. *Soundolier, Inc.*

64—Data Gathering System. Catalog DS-2 (8 pages) presents the Transacter, a new automatic data-gathering system. Applications include job order recording, production and inventory control, communication. *Stromberg Time Corp.*

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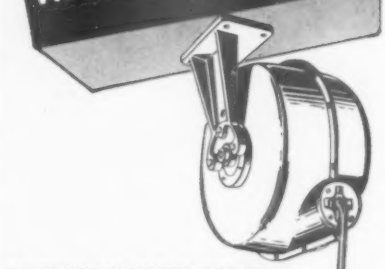

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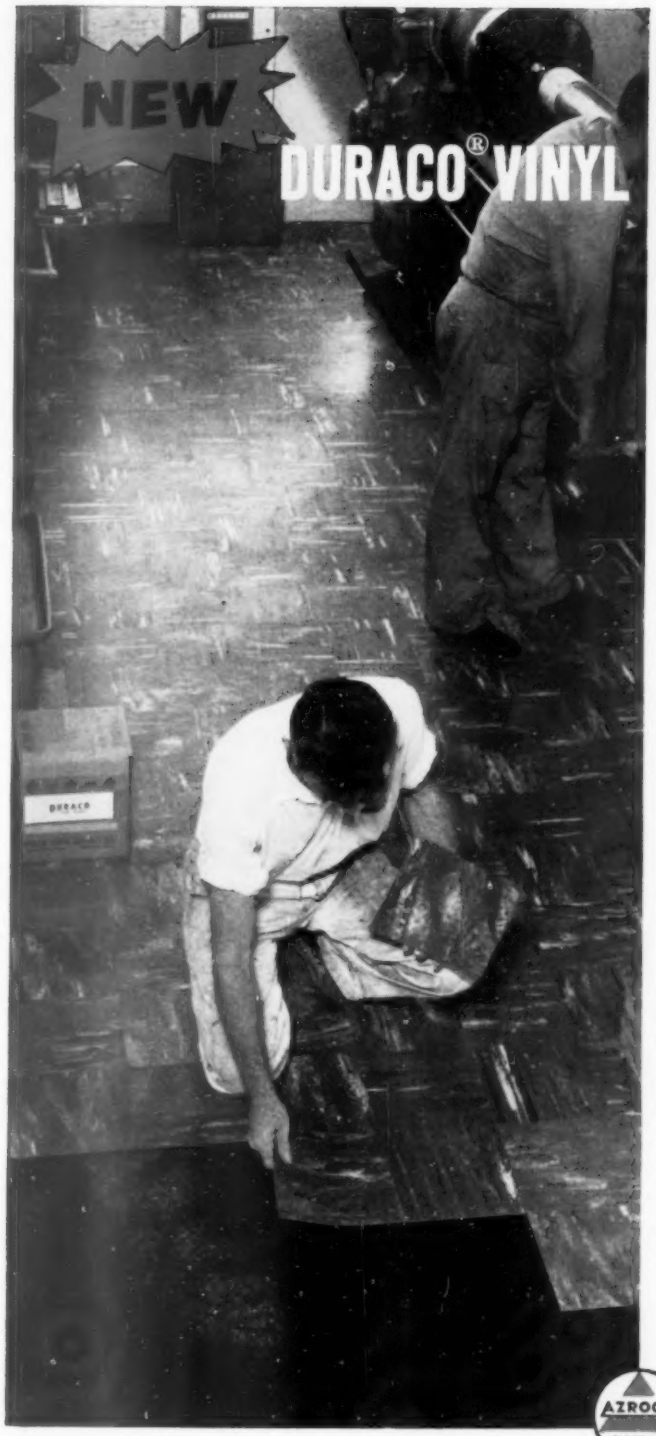

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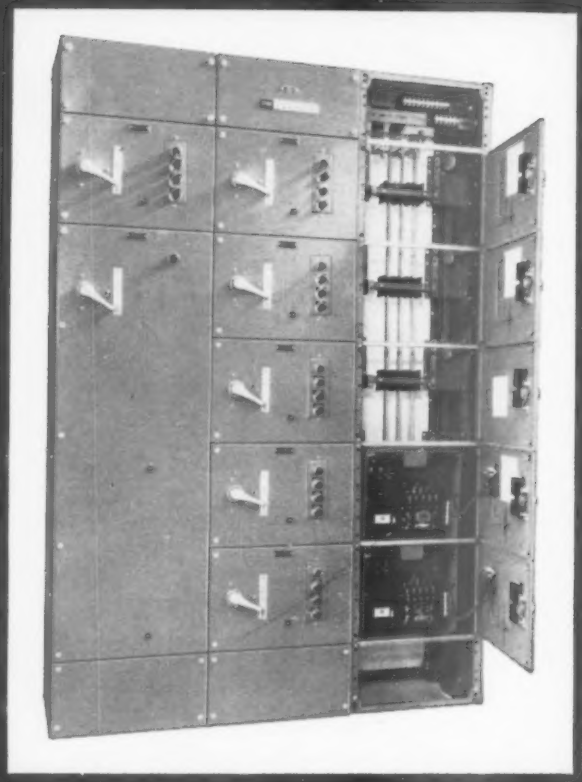

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CARL WYDER (below) is FACTORY's editor of plant maintenance and engineering. He gave the hard-hitting talk below at the 11th Annual Conference of the Philadelphia chapter of S.A.M. last February. What Carl said was so straight down the line of today's pressing needs that his associates insisted it be published. Here it is. It will stimulate your thinking by telling you . . .

How a Pro Looks at

"Just because you can account for every penny spent for labor or material doesn't prove it's well spent."

"One maintenance engineer told me he could save $1000 a week if he could get a clerk to keep certain records and statistics."

"REDUCING Maintenance Costs" is the topic of this session. I'm supposed to tell you quickly how to do it. It would be wonderful if I could wrap up the whole package for you that fast. I'm sorry it can't be done.

It would be wonderful, too, if I could offer you some short-cut panaceas. Or some startling "breakthrough"—a recently popularized and over-used word—on how to minimize maintenance costs. No, I have nothing novel to offer. All I can give you is the well-founded gospel my publication has long been preaching on this subject. It's a gospel of salvation from high costs. Many companies still won't buy it.

In that gospel Chapter 1 and Verse 1 lead off with a very important question: Should you try to cut your maintenance costs at all? I repeat: Should you try to cut your maintenance costs at all?

Think it over carefully. Maybe you shouldn't. In fact, I know of some plants that should be increasing such costs. I hope you know why. It's simply because maintenance is so poor in those plants that production suffers. There's abnormal production downtime, excessive product spoilage, and accelerated depreciation of plant facilities and equipment. Moreover, repair bills are higher because work cannot be planned, and work requires overtime and involves costlier repairs. Net result is that the product's unit cost at the shipping door (or end of the pipeline) is higher than if more had been spent for maintenance.

Do you think top management is too enlightened to allow this sort of thing to exist today? I don't—I hear of it often. Just a few months ago a maintenance manager of a large manufacturing operation told me he

Maintenance Cost Reduction

had just faced this very problem. It was so bad that 75% of all his repair work was on emergency repairs, with the cost penalties I've just described.

Another case: At the recent Cleveland Maintenance Conference a maintenance engineer privately told me a similar story. Said he: "Anybody can cut maintenance costs—you just don't do as much maintenance as you should. That's what happened in my plant. The sad part of it is that top management promoted this plant engineer who had slashed the maintenance budget, because it thought these lowered costs proved he was a good manager. Now we're having to move in and clean up the mess. It will be at least several years before we catch up."

I won't labor the point. I think you'll all agree that we can redefine our objective to that of cutting maintenance costs without cutting necessary maintenance. In other words, let's now assume we know what the optimum level of maintenance should be—it varies for each plant, of course—and that our problem is narrowed down to providing that level at lowest cost.

In my editorial capacity I meet many plant management people—in higher, middle, and lower management positions—in production, maintenance, plant engineering, industrial relations, and other functions. Habitually and almost unconsciously I probe at each occasion for the nature of their problems, to guide my own editorial thinking. When it comes to maintenance problems, I have found an overwhelming need, not for more technical know-how, but for adoption of more and better management practices.

Now by this I don't mean there are no technical problems—those calling for the knowledge and skills of mechanical, electrical, chemical, civil, and other graduate titles of engineering. There are such problems, and plenty, but they are usually quickly recognized and solved. They have to be, or the plant or process or operation won't run. And when the wheels stop, you know what will happen. Top management will be on your neck wanting to know "What's wrong? When are you going to fix it? Get to work—or else . . ." But this need for a quick solution doesn't characterize most defects in maintenance management. A plant can hump along on sloppy maintenance management—or in production—for months or years before creditors or the break-even point catches up with it. But at what a price!

"What the maintenance function needs most of all . . . is better management"

So I restate in terms of today's subject: What the maintenance function needs most to cut maintenance costs is better management. Any of you who attended the Cleveland Maintenance Conference in January—or even those in earlier years—must have sensed this fact. In the question-and-answer periods in session after session listeners poured in questions on management: "How can I improve my organization? My paperwork? My work planning? My scheduling? My control of costs?

Ten years ago most maintenance people were not only cool to, but also downright resistant to anything that smelled like a management technique. As one observing maintenance executive put it: "Too many maintenance heads think their job is maintenance and repair only. They don't see the value of work analysis, job planning, and checking performance." And I'd like to add: Too many plant managers and production men have got to thinking the same way about maintenance. Small wonder they have traditionally viewed it as a dirty-hand service assignment slightly above the trash collector or machine-cleaner status.

Fortunately industry is beginning to see the light—and to break that tradition. I've been in plants where the maintenance function is properly recognized—and where maintenance costs get the same detailed screening as production costs. If any proof is wanted as to what's at the bottom of this change in status, here it is. Every time I get the chance in such plants, I have asked higher management: "If you were choosing a maintenance head, which man would you prefer—one who rated No. 1 in engineering and No. 2 in administrative ability, or *vice versa?*" The answer is always *"vice versa"*—give me the man with better administrative ability."

Turn the page

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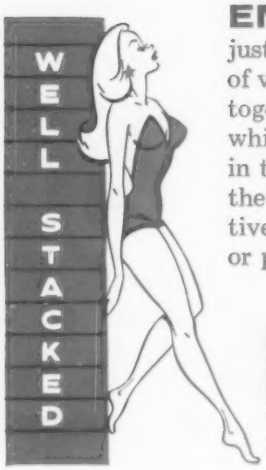

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Begins on page 222

So I would say—and here I address myself to top management—the first big step that you, Mr. Top Manager, should take in cutting maintenance costs is to get a good administrative head—a maintenance manager, if you please, instead of strictly a topnotch engineer.

But wait. Don't fire your present engineer. He may be just the man you need. He's already so valuable in engineering you'd do well to give him first crack at taking over administration. In fact, he may have been itching for a long time to do a better administrative job, but you wouldn't let him. Has he ever asked you, for example, for a clerk to help him get better costs? And have you growled back: "What, more overhead? What have I got an accounting department for?"

"Many plants don't know their real maintenance costs"

If they ever did know, they'd really do something about them. In FACTORY's survey of 359 plants on maintenance management practices (September 1958, page 90) we found that 5% kept no records, another 25% were kept by the maintenance department (you can imagine how loose they might be), and of those kept by the accounting department 25% were not tied into the general ledger. Of those plants keeping costs, 10% were satisfied with only total costs for labor and material; another 9% subdivided these totals into major accounts of repair, replacement, new work, and so on; 37% further subdivided these totals by departments or cost centers; and a minority of 44% subdivided them by machine or process.

These figures don't tell the whole story. Even in plants with airtight cost procedures, I have reason to suspect that many things charged to maintenance aren't really maintenance at all. One maintenance executive I know was put on the carpet for high repair costs. He then did some private investigating and shocked top management with the evidence that almost two-thirds of the bill involved was for alterations, new equipment, modifications, experimental production services, and

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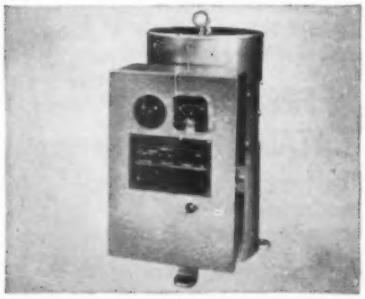

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Begins on page 222

other gray areas of expense—and all these with top management approval.

The second big step in cutting maintenance costs is just this: Many maintenance cost accounting procedures need a major overhauling. And in the procedure the maintenance manager should be asked what he wants to know.

"A good maintenance manager must know accounting"

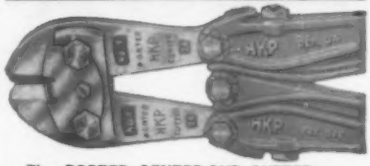
For too long has the accounting department arbitrarily decided what it wants to know and what accounts it wants to set up. Let the maintenance manager go over the account classifications with the controller or chief accountant. If he needs 50 categories to pinpoint expenses for better analysis, why shouldn't he have them? What's the accounting department for?

I know the answer of some short-sighted accountants to this question is: "What does a plant maintenance engineer know about accounting?" In rebuttal I'd like to quote a comment by Oscar Graveley of Union Carbide Metals Company, the main speaker of the 1959 Cleveland conference. He said with great emphasis: "It's an absolute necessity for a good maintenance manager to have a good knowledge of accounting."

To which I'd like to add that even if the maintenance head were not so well qualified in this field, his company should at least see to it that he gets detailed cost breakdowns equivalent to those given to the production or sales department. Let's face it—maintenance is a complex function, and probably needs as many account classifications as production, largely for its internal use.

Now if after you go back home you should try this expansion of maintenance accounts, let me warn you what might happen. When you present your suggested list of account breakdowns, your chief accountant will squawk like crazy, or if he's in a more amiable mood he'll try to win you over to his side with a plea, "Let's see if we can simplify this list." And if you give in, you'll lose the tight control you were after. The development of control data is just as vital as the proper mechanical

THERE'S A



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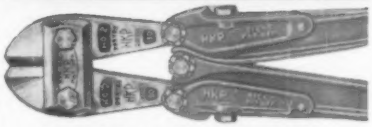

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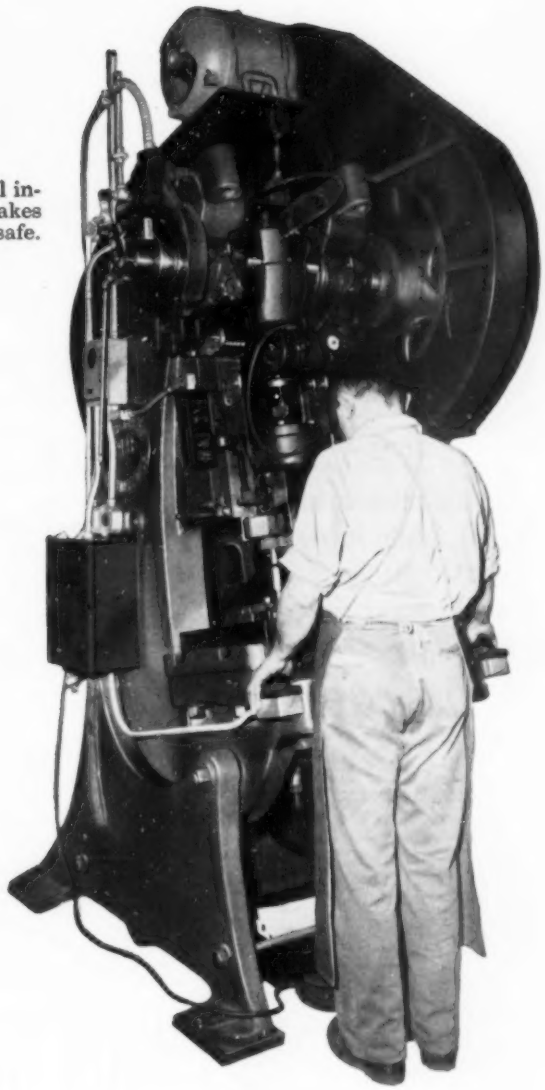

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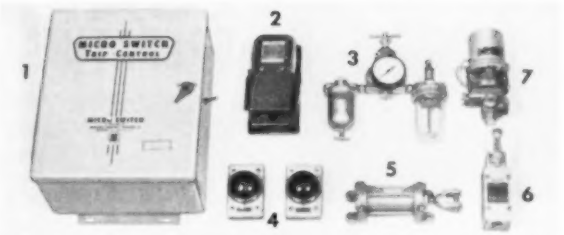

Trip Control components in the above installation include: (1) control box, (2) foot switch with toe guard, (3) air filter, regulator, and lubricator unit, (4) hand switches, (5) air cylinder, (6) limit switch, (7) solenoid air valve.

Ask for new revised edition of Catalog 65a

Honeywell
MICRO SWITCH Trip Controls

For more facts Circle 580 on Reader Service Card

7 big reasons why A. O. Smith *Permaglas*® glass-protected (inside and out) smokestacks are your best investment

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3. low maintenance — glass can't rust
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5. lower cost — glass protection now within reach of all
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Begins on page 222

techniques to arrive at the optimum point of operation.

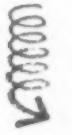
Now let's assume you've achieved a point of harmonious relations with your accounting people, so you're getting excellent and accurate weekly and monthly cost reports.

Does this promise lower maintenance costs? Absolutely not. That you can account for every penny spent for labor or material doesn't prove it's well spent. But knowing where it's spent is the window to uncovering excesses and controlling them. Statistics don't replace judgment, but they sure help to make better decisions. And there are other items of cost information you'll want to use—hidden or indirect costs such as types of downtime, or cost of unnecessary repairs. A smart maintenance manager won't overlook these areas in setting up his codes for labor and material expenditures.

I want to touch briefly now on a third important step toward cutting maintenance costs. It deals with a big weakness in organization. I'm referring to the lack of sufficient clerical, secretarial, or staff help. Higher management usually sees red when you voice this criticism—more overhead and unnecessary paperwork, you know. And even many maintenance heads insist they don't need a clerk or an assistant. Or they try to get along with a part-time one. They'd rather carry the office in their hats.

I'd like to disagree with this penny-pinching practice—I've seen much evidence that it's really expensive. One maintenance engineer, for example, told me he could save his company $1000 a week if he could get a clerk to keep certain records and statistics for him. And he showed me examples that were mighty convincing—yet his higher management wouldn't budge on the "no-clerk" dictum. Another engineer asked his secretary—yes, he had one—to work-sample his activities. He found about one-third of his time was spent in work a clerk could do, thus preventing his doing work that needed his managerial skills.

The same weakness applies to staff help and supervision. In one large plant a reorganization of staff and clerical help added 25 to the

If it rolls on an axle or turns in a bearing or rides on a shaft
if it slides in a groove or moves
on a pivot if it bores  or
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maintenance office organization. Shocking, perhaps, if I failed to mention this move cut 45 shop men, saved over $120,000 in annual wages. And saved $1-million more in maintenance costs through higher worker effectiveness.

Now how about your foremen? Do you have enough supervision? One maintenance superintendent had this to say: "I can get more work done with two supervisors over 12 men each than I can with one supervisor over 25 men."

Of course, these isolated cases don't prove the point. But they are so typical of the many I have seen or have been told of in plant after plant that I cling to this conviction: You would do well to re-examine your maintenance organization, not only for inefficient use of engineering and managerial skills, but also for the potentialities released when such skills are relieved of routine clerical work.

Let me remind you of several other ways to cut maintenance costs. In this quick review I'll first mention the way, and then cite an example or two to clinch the point I want to make:

• **Planning and scheduling**—By its use one plant increased planned and completed work from 50 to 92% in 2 years. And it cut emergency call-ins from 400-500 per month to 16-18 man-hours per month.

Another large company is saving $500,000 per year by this technique alone. And here's a comment from Jodie Eisenhower, head of maintenance coordination at Humble Oil, at the Cleveland conference: "Some people don't like planning and scheduling, call it red tape—but it sure saves a lot of time and money."

• **Methods study, work simplification**—There's no way to evaluate over-all results—they become evident with each job. For example:

Job: Paint a floor. *Method:* Dump paint on floor, spread with a squeegee. Sure, higher paint cost but much lower job cost.

Job: Clean floor with push-broom. *Method:* Use wider broom, put wheels at each end so broom doesn't need lifting on back stroke.

Job: Insulate a process machine that looks like a cross between an

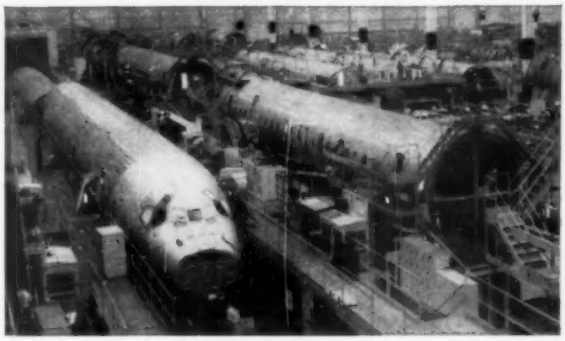
MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

Jet age materials handling techniques used in production of Douglas DC-8

Grooved wheel casters

Major advantages of Bassick grooved wheel casters are more efficient movement of materials, better utilization of floor space, floor protection and close control of parts and equipment handled.



As the 19,000 pound fuselage assemblies for DC-8 Jetliners take form in the DC-8 assembly building at Long Beach, California, big Bassick Grooved Wheel casters shoulder the giant load.

Many other handling jobs in the production of more than a hundred DC-8 Jetliners at Douglas Aircraft Company, Inc., were also turned over to grooved wheel casters, operating on inverted angle iron tracks (see inset). Handling fixtures rode grooved wheel Bassicks to bring workers into position to assemble nose section. And lower fuselage sections are rotated on rigid grooved wheel casters built into giant turning rings which themselves ride additional grooved wheel casters.

As material and labor costs continue to rise, many major aircraft and other companies are streamlining materials handling methods as a means of holding price and profit lines . . . an idea well worth your careful consideration.

NEW SANITARY CASTERS

Bassick's new B-line includes 4" and 5" rigid and swivel casters. They are specially designed for easy cleaning to conform with the Baking Industry's Sanitary Standards. Sanitary casters are ideal for use in food processing, bottling plants, restaurants, pharmaceutical houses, fine chemical plants, textile plants, hospitals . . . anywhere cleanliness is important.

Casters on duty at White Sands Proving Ground

When IGY researchers use modified Nike missiles (above) to gather temperature, pressure and wind data, the launcher rolls out to the pad on casters. Bassick casters are also widely used in missile production as well as launching and testing. Reason: sturdy Bassick quality construction safeguards loads handled.

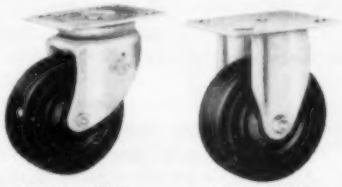
Your Distributor can keep you up-to-date on handling methods

Don't be fooled by the big wooden wheels on this modern Trojan Horse. Actually, it rolls on Bassick Series "77" swivel and "78" rigid casters underneath. Point is that we've learned something about materials handling in the past 4000 years. And we keep learning . . . with new ideas, new products, new angles coming up all the time. Good man to keep you abreast of the latest materials handling data is your local industrial distributor who handles Bassick casters. It's good business to know him. 9.36

RUGGED CASTER DUTY

At Robinson Brick & Tile Company, Denver, Colorado, they "package" 20 million bricks a month. Bricks are mounted on nine carts equipped with rigid Bassick grooved wheel casters, rolled into position for steel strapping and then placed in storage by a fork lift truck. The casters above are left in the open, exposed to all weather and have been used three years without replacement.

New "Qualecon" casters



Series "87" Series "88"

Taking their name from the fact that they combine quality with economy, Bassick's new sizes of swivel and rigid wrought-steel casters are designed with the quality features of Bassick "H-99" series casters and quantity produced for economy.

The Qualecon casters are ideal for platform trucks, portable lifts, conveyors, stock trucks and much other equipment where total loads range between 1000 and 2000 lbs. for hard wheel casters or 600 to 1200 lbs. for soft wheel casters.

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octopus and an elephant. *Method:* Instead of trying to cover yards of pipe and uneven surface, the engineer housed this dimensional atrocity in an insulated box, with entrance door. He not only achieved a big saving in the cost of the original installation, but he has also avoided having to rip off any insulation when making repairs or adjustments.

• **Study of materials and design for corrective maintenance**—A chemical plant had a severe corrosion problem with some of its structurals—thinner dimensions of web continually weakened before the rest. The company solved the problem by substituting round pipe, which corroded evenly on its circumference.

Another plant used a new adhesive to hold flanges or railing posts onto concrete. It eliminated lagging, did as good a job in a fraction of the time needed for lagging.

We've only scratched the surface in documenting the lead part played by better management techniques in cutting maintenance costs. Need I pile on more evidence? Surely you know about preventive maintenance, work-order systems, data files, work measurement, equipment records, backlog reports, manuals of standard practices, supervisory and worker training, use of prefabs, trouble analysis, spare parts control.

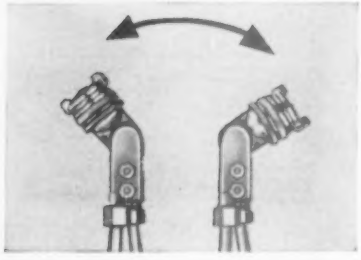
There's a significant thing about most of these techniques that I feel I should point out. It's that their adoption depends on the initiative of the maintenance executive—nobody else. In the past I've heard scores of maintenance executives complain repeatedly that they could do a lot better if it weren't for the unions and higher management. The unions, they said, were hamstringing them on getting a decent day's work for a day's pay. And higher management wouldn't give them all the facilities they needed.

You know, for a time I actually got to believing this. But one day I woke up to an important fact: These management tools have to be picked up and used by the maintenance manager if he wants to improve worker effectiveness and win management support of his program. In short, a maintenance manager writes his own ticket for his success.

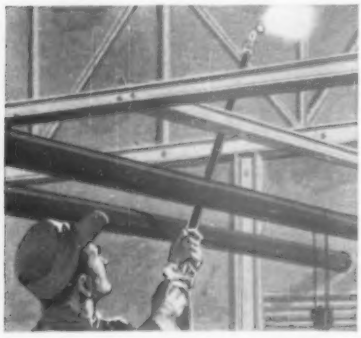
Turn to page 236

Spray gun with 6-ft. reach

. . . lets you paint ceilings, and out-of-reach areas without scaffolding



Gun's swivel head permits spraying at any angle; adjusts quickly and easily, without tools.



Spray pattern ranges from broad fan to narrow round shape, for coverage best-suited to surface.

Why go to the expense, the bother, and the risk of using scaffolds to reach remote areas—when you can do the job without them.

The DeVilbiss P-NU Extension Gun not only saves man-hours usually wasted in setting up and moving ladders and scaffolds, but probes through narrow openings to paint many otherwise inaccessible areas. Available in both 4- and 6-ft. lengths, it is complete and easy to handle . . . covers everything from flat surfaces to narrow structural steel efficiently and economically.

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first in silicones

Dow Corning

SILICONE NEWS

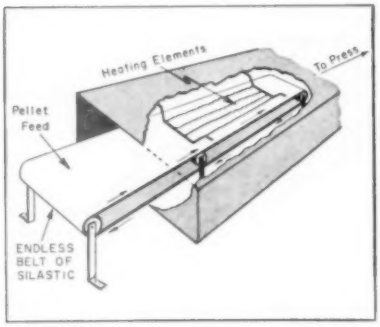
production and maintenance edition • No. 29

CUTS DOWN-TIME & CLEANING

Contamination build-up on electrical insulators usually means double trouble. It can cause service interruptions and it also creates a cleaning problem. If these are your problems, you'll want to learn what one company did to solve them. Alpena (Mich.) Power Co. has lines adjacent to the world's largest single cement plant. Air-borne cement dust, being extremely tenacious, can build up quickly on the pole line insulators and cause flashovers. The old method of checking the problem was to remove the contaminated insulators and send them to the maintenance shop for a scrub job. In addition, larger 65 kv insulators were installed on the 34.5 kv lines to reduce flashovers and increase the interval between cleanings slightly. Alpena Power men had almost accepted this as standard practice when they tried the following experiment.

They applied a silicone coating of Dow Corning 5 Compound to three of four insulators in an area where cement dust was heavy. The fourth insulator was wax-coated. After seven months all were cleaned without being removed. The three silicone coated ones were easily wiped clean with dry rags in a total time that was only a fraction of that required to clean just one wax-treated insulator with solvents and steel wool! Further testing bore out the superiority of Dow Corning 5 Compound.

As a result, Alpena Power is sold on silicones for its insulators. The silicone compound makes possible fewer cleanups, faster cleanups, reduced man-hours, and fewer outages of shorter duration. ***No. 298***



"STICK-PROOF" RUBBER

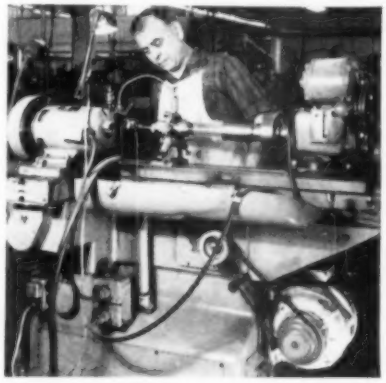
Ever wish for a rubber that plastics or other materials would not adhere to at oven temperatures? Look no further . . . you'll find it in this story from B. F. Goodrich Footwear and Flooring Co., Watertown, Mass.

The process: making products of vinyl plastics. The problem: pre-heating vinyl pellets before they reach the presses. The pellets are carried on an endless belt through a tunnel oven. Of what material should this endless belt be made? It must be flexible. It must stand heat.

Originally, B. F. Goodrich used a belt made of wire mesh. Scheme of arrangement is shown at left. But, this belt presented problems; fines in the vinyl pellets filtered through the mesh and were carried along the lower return pass. Accumulating on the head and tail pulleys, the gummy fines soon caused belt distortion, eventually untracking the belt. This meant frequent shutdowns for cleaning.

So, B. F. Goodrich tried something new. They bought a wire mesh belt impregnated with Silastic®, the Dow Corning silicone rubber. Chase-Walton Elastomers did the impregnation on the 4′ 8″ by 13′ 6″ belt. This different approach paid off . . . the new belt went into operation in late 1956, and it's been running without a hitch ever since. Despite repeated, long-time exposure to the 160-180 F temperatures required to soften the vinyl pellets, the Silastic belt stays flexible and rolls along without hindrance from gum-ups!

If you need a heat-resistant, flexible solid somewhere in your plant, why not look at Silastic? ***No. 299***



INSULATED FOR OVERLOADS

No matter how smoothly a motor runs in ordinary service, it could burn out in short order if given a rapid reversing job. To prevent this, your best bet is to do what Cadillac Gage of Detroit did.

At Cadillac, drive units installed on several pieces of machinery were giving trouble. The units—1 hp, 1800 rpm Class A motors—were put on jobs calling for as many as 100 reversals per *(Cont. Pg. 2)*

HOT TIP FOR PACKAGERS

Bean-bags are no game but serious business to the machine you see here. And in this smooth packaging operation lies quite a story. If you have any heat-sealing machinery or other hot surfaces that tend to get "gunked up", this story should be of real interest.

Michigan Bean Co. (Saginaw, Mich.) operates the world's largest bean elevator, and markets its many products under the Jack Rabbit label. These beans—and peas, and lentils—are packaged in polyethylene for eye-appeal on store shelves.

The polyethylene bags are formed, filled, then sealed shut on the equipment shown. And it was here that Michigan Bean found a bottle-neck. During heat-sealing by the high-temperature band type sealers, the plastic tended to decompose slightly and form a sticky build-up on the bands. This, naturally, prevented proper closure of the bags and slowed production.

Michigan Bean found a way to beat the build-up by applying silicones. A felt wick applicator and fluid reservoir were fitted on the machines. The wick now spreads a Dow Corning silicone release agent on the bands at a rate of about three drops per minute. Result? No more plastic build-up . . . the bags release smoothly.

Vertical bag-filling machines are also now treated with silicones. Though Michigan Bean has put Teflon tape on the bag chutes for good slip, production men find they get still greater insurance against jam-ups if they coat the tape occasionally with a silicone release agent.

Is there a place in your plant where the famous "slip" and heat resistance of silicones can help? *No. 300*

INSULATION *(Continued)*

minute. This created too much heat for the insulation and motors burned out quickly.

Cadillac Gage found the best way to beat the heat was to have the motors rewound with insulation made from Dow Corning Silicones. The superior heat stability of silicone insulation enables the motors to carry overloads that quickly destroyed previous insulating materials.

Result: not a bit of trouble has been reported since the silicone rewinds were put to work. In fact, Cadillac is so pleased with its first silicone rewinds, it has since had several other motors rewound by Howard Electric Co. of Detroit with silicone insulation. *No. 301*

new literature and technical data on silicones

A Full Color, sound movie lets you see how silicone insulated motors are wound. A step by step procedure depicts why silicone rewinds are premium quality. Case history information shows how silicone insulation virtually eliminates motor failures and reduces maintenance costs as it increases production in different manufacturing plants. For information on how to obtain this movie for showing in your plant, check *No. 302*

On the Spot sealing, encapsulating, caulking or potting can be done with Silastic RTV, the Dow Corning silicone rubber that vulcanizes at room temperature. Available in several consistencies, ranging from that of caulking compound to a pourable fluid, Silastic RTV sets up in minutes . . . forms a resilient solid. Its use in forming flexible molds, waterproofing outdoor electrical connectors, sealing flush access doors or windows of pressurized interiors, as well as many other applications are described in pamphlet form and available to you as . . . . . *No. 303*

Surface - Maintenance Money Saver . . . Silicone-based paints provide up to 200% longer service life — greater protection. Illustrated case histories show equipment that has been kept rust-free and attractive longer. Superior weathering properties, heat stability and resistance to corrosion are offered by paints formulated with Dow Corning silicone resins. Complete information is available in this new, up-to-date, 4-page brochure . . . *No. 304*

Guide to Dow Corning Silicones is a comprehensive and concise review of silicone products for all industries. You'll find information on new materials that serve to reduce production and maintenance costs and improve product design. Silicone materials such as defoamers, rubber, release agents, packaging materials, lubricants, protective coatings, electrical insulation, and a variety of others are included in this Guide. *No. 305*

Performance-Proved Dow Corning silicone lubricants can help you solve problems created by adverse operating conditions. Designed for reliable service over wide temperature spans, specialized Dow Corning silicone lubricants are used on equipment ranging from freezers to core oven conveyors — at temperatures as low as −100 F, as high as 500 F. Properties and applications for silicone oils and greases are compiled in an 8-page brochure. . . . . *No. 306*

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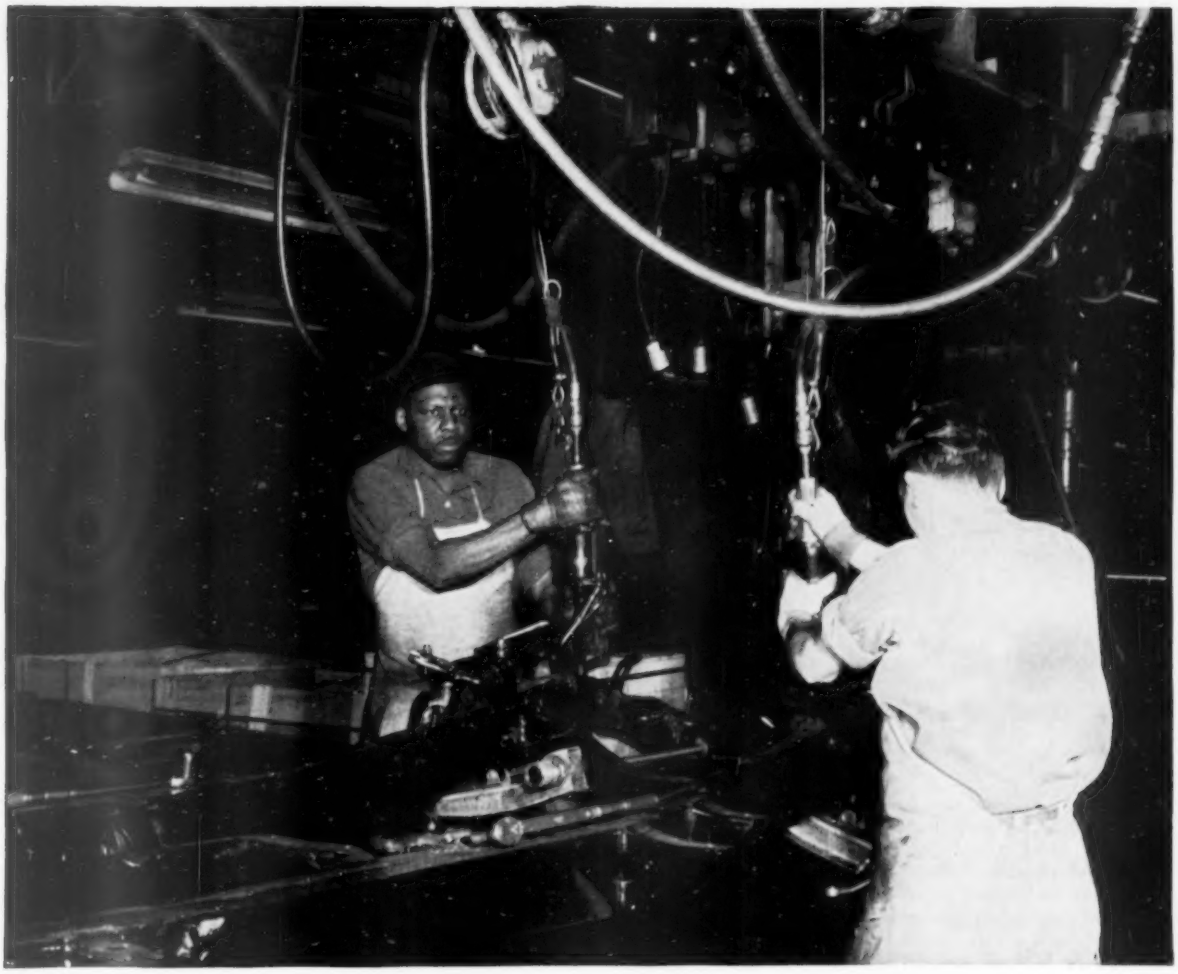

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New "angles" for fast, easy, close-quarter nut running

Taking over where straight line tools must leave off, Gardner-Denver angle nut setters speed close-quarter tightening of caster-camber bolts in an auto assembly plant.

These versatile air tools easily fit in hard-to-reach places . . . do the job quickly, in a fraction of the time required by other methods. Gardner-Denver 16C series nut setters hold torque within the required 70 ft.-lb. limits . . . combine fast run-down, reserve power with low noise level and low maintenance.

Find out how Gardner-Denver angle nut setters, along with a complete line of other air tools, may solve tough tooling and production problems for you. Contact your Gardner-Denver representative or write for bulletin.

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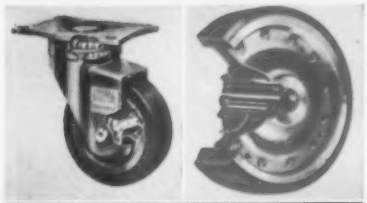

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MAINTENANCE COSTS

Begins on page 222

Maybe I can guess what you're now thinking: "Yeah, it's easy for that guy Carl Wyder to say these things, but he'd never sell *my* higher management." Gentlemen, one of the most frequent questions we FACTORY editors face in our reader correspondence and at meetings such as this is: "How can I sell my boss my cost-cutting idea?"

Now there are many accepted techniques for doing this. You surely know some of them: proper timing, brief reports, visual displays, specific costs and savings, supporting details, and so on. And they're all valid, and helpful. But they do often give you the impression that you have to be a super-duper salesman to get an OK on anything you submit to higher management. As one maintenance executive put it to me: "Gosh, if I have to learn to be that good a salesman, I'm applying for a transfer to our sales division, where I can earn more money."

"You don't sell. Your personality doesn't sell. It's facts that sell"

Does this selling problem bother you? Well, maybe this advice will help re-establish your confidence. It came from a man in an audience somewhat like this, during a discussion of better selling in maintenance. One man was complaining he couldn't get to first base with his boss in selling a better maintenance program. After several moments of lively discussion this particular character suddenly popped up and said: "I'm getting tired of men complaining they can't sell. Did you ever think that the reason your boss won't buy is because maybe you've got nothing to sell? You don't sell—your personality doesn't sell. It's facts that sell."

Those key words, "Facts sell," burned into my mind. I realized how a man can master all these wonderful selling techniques and still lose out—because to a tough top management only facts sell.

Yet I'd like to amend that last comment slightly, and I think you'll agree: The right facts sell. So the

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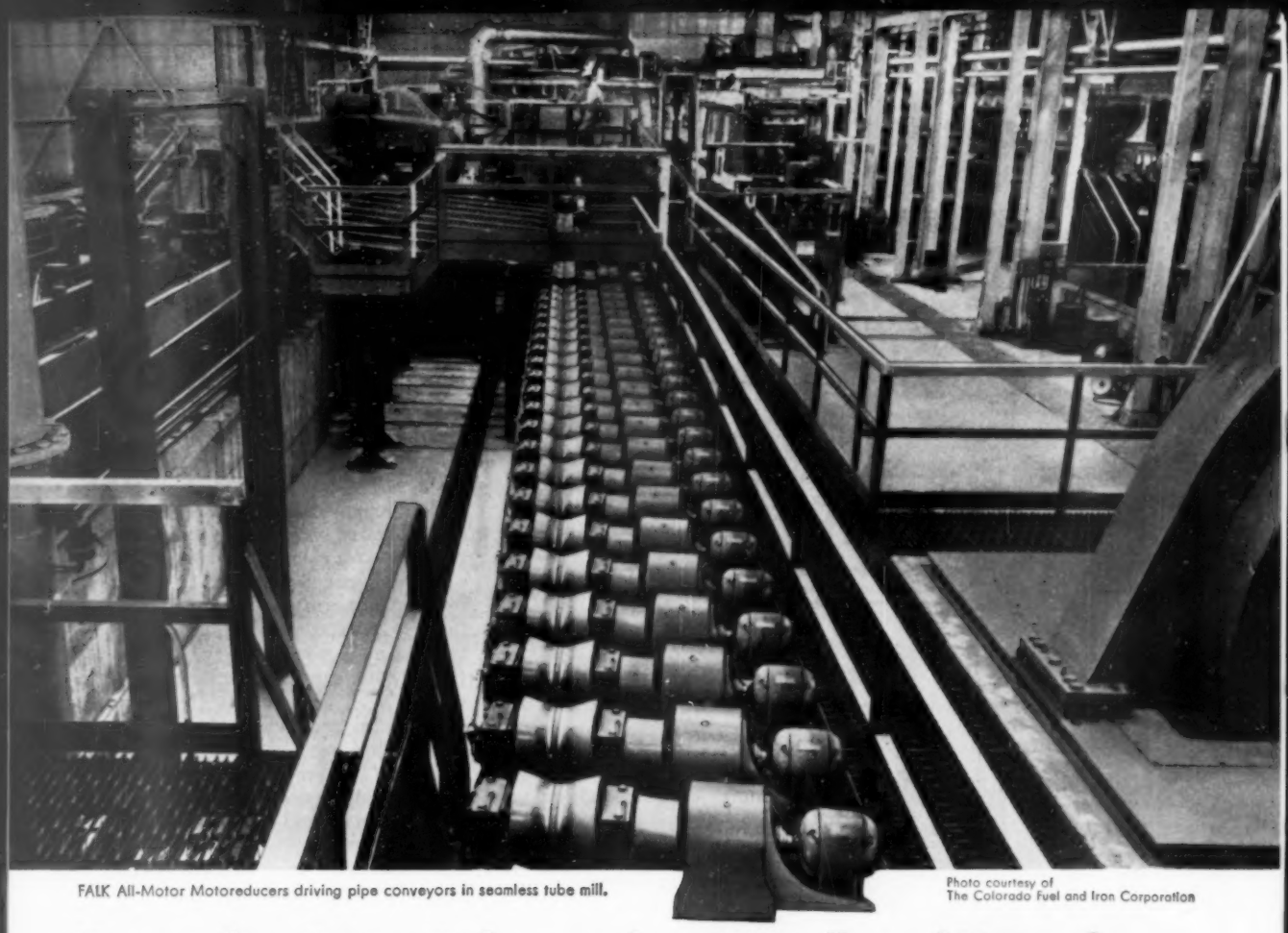


FALK All-Motor Motoreducers driving pipe conveyors in seamless tube mill.

Photo courtesy of
The Colorado Fuel and Iron Corporation

You get these "extras" when you buy FALK *all-steel* Motoreducers

1. **Freedom from damaged housings.** The exclusive FALK *all-steel* construction gives full protection from cracked housings or torn-off feet...plus twice the ability of cast iron to maintain vital alignment.

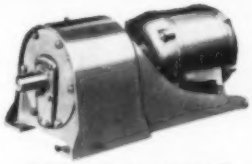
2. **12-15% reserve load-carrying capacity** in the gears, by AGMA standards. The extra-depth, high pressure angle helical gears are another FALK exclusive ...they assure better operation and longer gear life.

3. **Highest known gear efficiency**—98½% per gear train under full load! This means maximum productive work for your power dollar.

4. **Longer service life**...advanced FALK design makes it possible to machine both bores for each shaft assembly at one time, thus eliminating possible accumulation of tolerances that occurs when individually machined parts are assembled. The result—better alignment of revolving elements that permits units to transmit rated capacity longer.

5. **Standard units to fit your needs.** Integral and All-Motor® Motoreducers are available in horizontal, vertical and right angle types...a type for every use.

Units are available up to 75 hp; output speeds from 780 rpm down to 1.2 rpm. Prompt delivery from factory, warehouse or distributor stocks. Ask your FALK Representative or Authorized FALK Distributor for *Bulletin 3100.*



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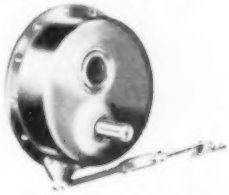
the original All-Motor unit

(Shown) Horizontal concentric model. Also available in right angle and vertical types.



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For higher pumping efficiency

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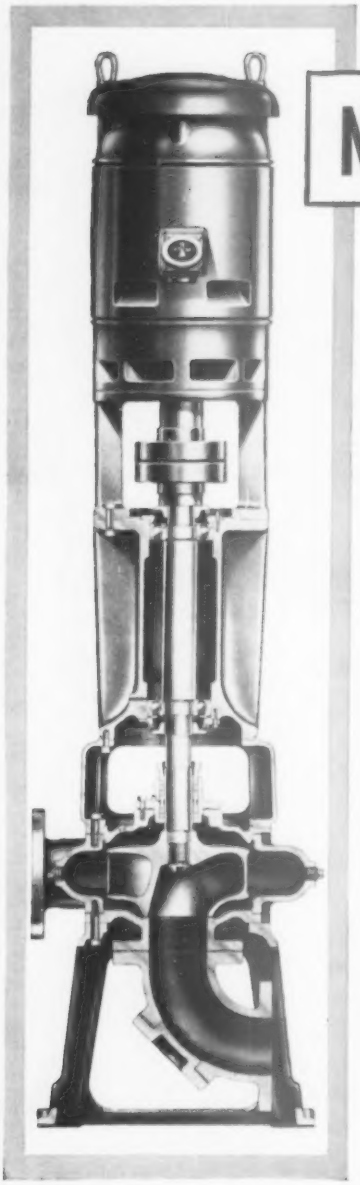

NEW

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5440A Non-Clog Pumps

Ideal for pumping unscreened liquids with large solids in suspension

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Here is your answer to higher efficiencies wherever you are pumping solids in suspension!

All-new Fairbanks-Morse 5440A Non-Clog Pumps feature quick, easy convertibility between any of the many vertical and horizontal types. Power requirements of the pump are always perfectly matched to the electrical and mechanical components. Precision-machined centering fits assure accurate alignment. Exclusive F-M bladeless impeller design minimizes maintenance by preventing clogging from solids and stringy material. The 5440A is only one of many F-M solids-handling pumps designed to meet a broad range of requirements. For information, write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

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COMPRESSORS · GENERATORS · MAGNETOS · HOME WATER SYSTEMS

Begins on page 222

next time you've got a proposition to sell, do this: Spend your time on getting together the right facts and stop worrying whether your hair is parted right or the boss had an argument with his wife that morning. What do I mean by "right facts"? Let's take a problem I hear about repeatedly—the complaint that "I can't sell the importance of the maintenance function to higher management." Did you ever think about pulling together such facts as:

- Amount of "net sales" your company has to ring up in the cash register to pay for every $1000 in maintenance cost you know you can save. I know of a successful maintenance manager who did just that. It made his people sit up and take notice.
- Ratio of maintenance costs to net profits for the last 5 years. Our S.E.C. survey last year shows the revealing figure of 67.3% average for 1957—and that was a good year for profits.

It's facts like these that engineers ordinarily don't think of. They are facts that relate to top management thinking, and therefore they're the "Open Sesame" to getting proper recognition and attention. Maintenance people are prone to complain about higher management indifference to their problems. If so, it's often because higher management doesn't know any better. And could this be because the maintenance manager has failed to keep his management informed of the right facts?

"Don't be surprised if your workers are only 35% productively active"

I seem to have strayed from my subject, don't I? But really, I haven't. The same principle of right facts applies to yourself if you are to be sold on the need for improvement in your maintenance set-up. How do you get such facts? One easy and quick way is by a work-sampling study of your maintenance operations. You can start, for example, on measuring the activity of your workers. Find out how much time they spend in walking to the job, in

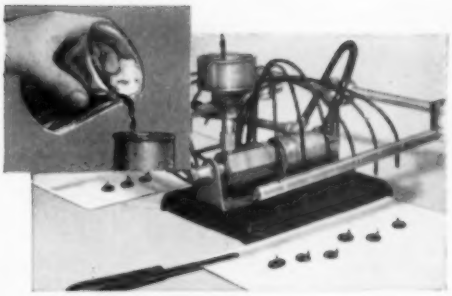
For more facts Circle 591 on Reader Service Card

For more facts Circle 592 on Reader Service Card ➤

Bertsch & Co. finds solution to lubrication problem... with Standard Oil's

RYKON Grease R

Centralized lube system pumps grease through 80 ft. lines in cold temperature; no clogging



Lab demonstration shows how RYKON Grease R works. Grease is poured into reservoir as a fluid. The shearing action exerted by pump and outlets irreversably converts fluid to a grease. Grease is ejected from outlet lines.

Problem: Bertsch & Company, Cambridge City, Indiana, makes pinch rolls and other metal bending equipment. A centralized lubrication system used on one pinch roll model had to pump grease 80 feet. Greases tried could not be pumped this distance without clogging lines. Since machines are shipped all over the world and are often in operation in cold climates, Bertsch had additional problems. The grease had to be pumpable in cold temperatures. It had to be foolproof so that customers beyond the reach of service calls would experience no problems.

What was done: Bertsch turned to Standard Oil for help. Standard Oil man, D. M. Simmons had the answer: RYKON Grease R. This is a rheopectic grease, one that flows like an oil. Its rheopectic properties cause it, under slight shearing stresses, to turn to a thick, durable grease. RYKON Grease R flows to the pump as a fluid, lubricates the bearings as a grease.

What you can do: Maybe you manufacture equipment that needs a centralized lubrication system and you have been looking for a grease like RYKON R. Get the facts about RYKON Grease R from your nearby Standard Oil lubrication specialist anywhere in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

Sons of founder, Harry E. and Robert O. Bertsch talk with Standard Oil lubrication specialist Donald M. Simmons. Don is well qualified to work with customers on difficult lubrication problems. He has the training and experience for it. Don graduated from Purdue. He has seven years service with Standard. He has completed the Standard Oil Sales Engineering School.

working, in waiting for repair parts, in personal time. Don't be surprised if your workers are only 35% productively active. And don't blame them for loafing, because your work-sampling technique will probably reveal that poor planning, poor scheduling, poor storeroom service —in other words, poor maintenance management—may be the real causes. I recommend such a survey, if you haven't already made one, as the quickest guide to what to do to cut your maintenance costs.

There's another approach to finding weak spots, that of auditing your various operations. This is what one plant did, as described in an article called "How to Make a Maintenance Audit" (FACTORY, August 1958). In it you will find 114 questions that poke and pry into your maintenance practices.

Now let me tie the string around the package, just to refresh your minds as to the sum of this talk.

There are three big steps toward cutting maintenance costs:

1. Get yourself a good maintenance manager. That's my advice to top management. To the maintenance executive I recommend: Learn modern administrative techniques if you want to stay in the saddle. Because if you don't learn, some good administrator is going to be No. 1 man in your place sooner or later.

2. Set up a reliable accounting system. One that will not only show what your maintenance costs are, but also allow a continuing comparative analysis of where the money goes.

3. Provide enough clerical, staff, and supervisory people. They'll help you collect and interpret the facts, diagnose the faults and weaknesses, and apply the cures.

With this kind of start, you'll be able to pick up the management tools I spoke of earlier, and use them skillfully and effectively.

If you tackle the cost-cutting job without using this three-plank platform, I fear you'll do no better than a mediocre job—or perhaps you won't make the grade at all. Remember, Mr. Maintenance Manager, you don't have to wait for higher management to recognize or improve your function. Your future as a manager depends mostly on you. **END**

Unisorb Pads are the basic unit in a mounting specification used to install 107 machines, including heavy Gisholt Turret Lathes and small bench grinders.

Minneapolis-Honeywell reports...

Unisorb Pads Saved Over $15.00 On Every Machine Installation!

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- There were savings on anchoring materials
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- Greatly reduced productive hours lost in moving
- Machines kept in alignment
- Provides ease of shop rearrangement
- Machines stay safely anchored in place

Company after company are discovering these same facts — that Unisorb Pads and Unisorb Level-Rite Mounts can save time and money, and cut noise and vibration, every time a machine is installed.

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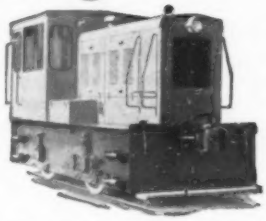

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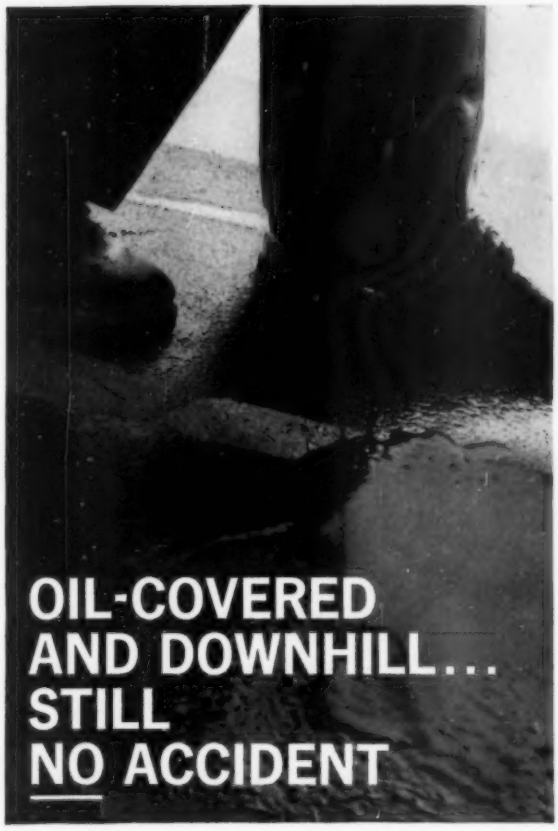

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Protect skilled workers and avoid costly production breakdowns by installing Alcoa Abrasive Tread Plate in areas where slippery materials accumulate. For more information check the coupon below, write Aluminum Company of America, 1687-F Alcoa Building, Pittsburgh 19, Pa., or call your nearest Alcoa Distributor.

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Show me how Alcoa Abrasive Tread Plate prevents slipping.
Please send a FREE sample—also application, design and fabricating data

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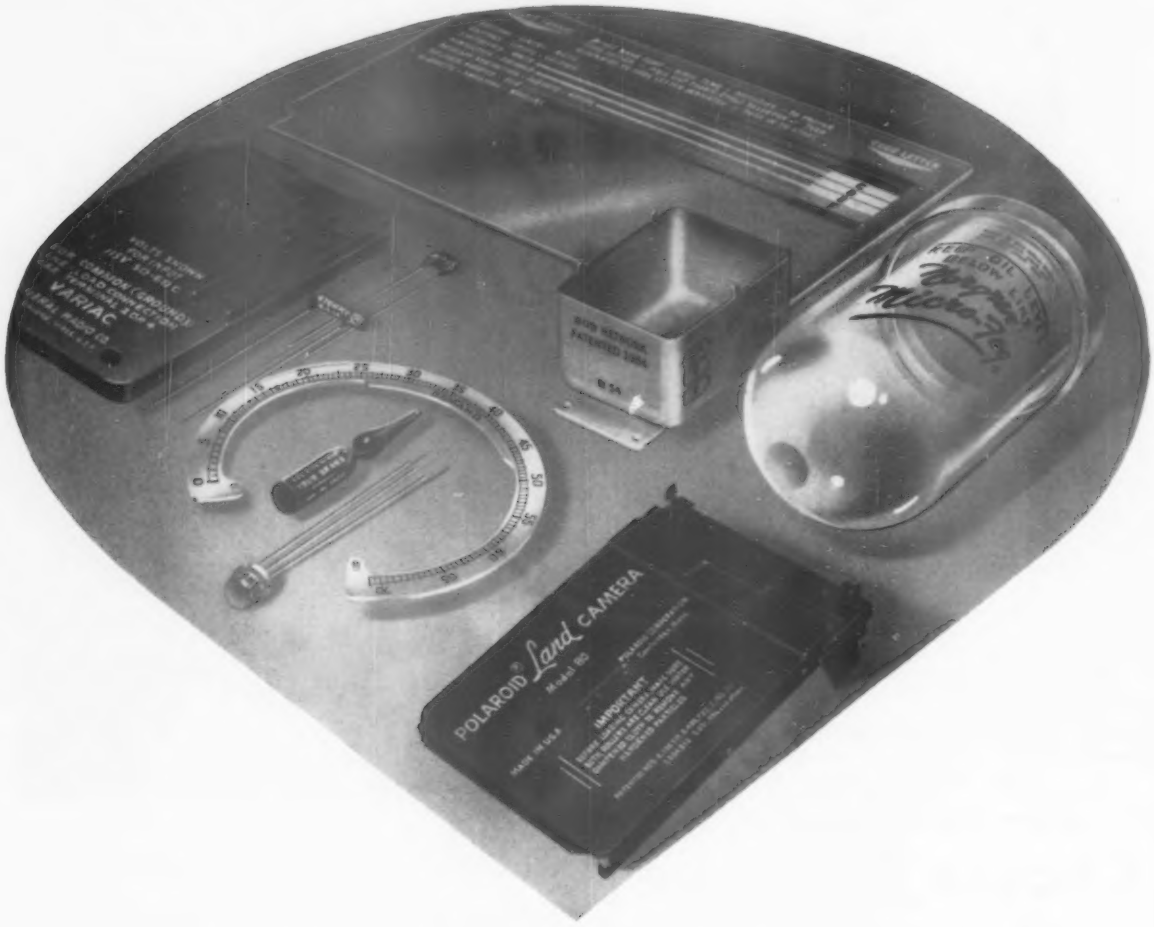


You know how to make it — we'll show you how to mark it

When a new product has to be marked — or the imprint on a present one improved — how do you solve the problem? Perhaps you've tried building your own marking equipment, and later found the results didn't justify the investment in engineering time and money. Possibly existing equipment was modified to do the job, or a "quick bargain" machine was bought — and the price paid was poor marking quality, inflexibility, or production delays because of a slow process.

Every one of these pitfalls can be avoided by a single step: call in a Markem field engineer at the start. He'll study what you have to mark, ask a lot of questions about how many and how fast, what handling your product gets, how often the imprint must be changed, whether you want marking to be a separate operation or right in your line. Then, after thorough study by Markem, he can tell you *exactly* what Markem machine, type and specialty ink is best for your job, how fast they will mark your products and how much it will cost.

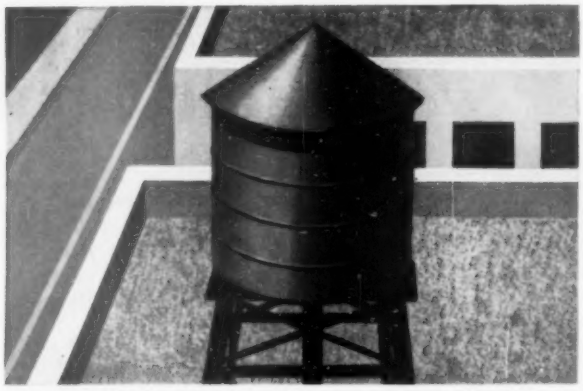
The machine, most likely, will be one from more than 40 standard, basic Markem groups. After spending nearly 50 years building marking equipment and nothing else, Markem has machines and inks to identify or decorate almost any size, shape and material you can name — and new equipment is constantly being developed.

The advantages to you can all be summed up this way: why spend *your* valuable time, money and talent trying to lick a new marking problem — when Markem has probably already solved it, or one just like it, for someone else? For marking parts or complete products . . . containers and packages . . . tapes, labels, tags and scores of items, the *right* marking method — with Markem equipment — will provide the quality and economy you need. Write Markem Machine Co., Keene 18, N. H.

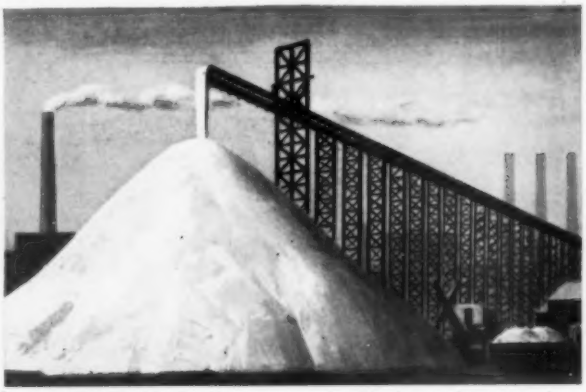
MARKEM

EVERYTHING INDUSTRY NEEDS . . . FOR PROFITABLE MARKING . . . SINCE 1911

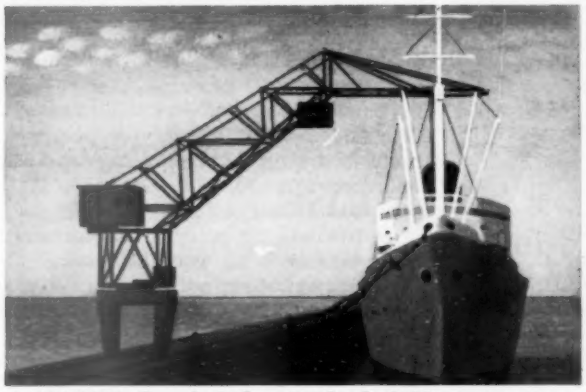
HOW WOULD YOU SOLVE THESE CORROSION PROBLEMS?



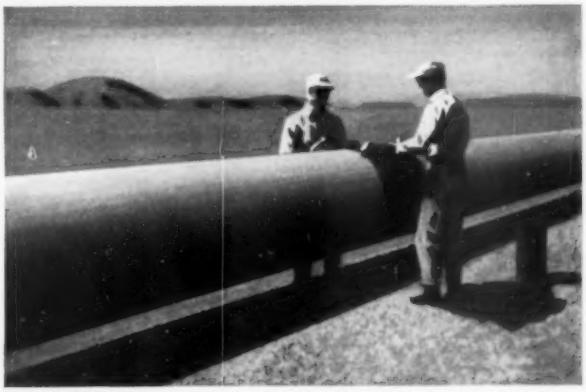
1. PROBLEM: Coat inside of factory water tank without affecting taste of the water.



2. PROBLEM: Protect conveyor trestle from the corrosive effects of harmful chemical by-products.



3. PROBLEM: Guard vital parts of a dockside gantry crane from salt spray corrosion.



4. PROBLEM: Coat, while in the field, joints of welded pipe without priming or torching the surface.

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Each Allied Chemical *Job-Matched* Cold Coating (formerly named Barrett) is made to solve specific corrosion problems. When you apply the right control you eliminate costly testing and reapplications. And *Job-Matched* Cold Coatings are inexpensive to begin with!

1. SOLUTION: *Allied Chemical T.O.F.* (#114) Coal-tar material specially compounded for the inside of potable water tanks, pipes, hydrants, hose houses and equipment where no residual taste or odor can be tolerated. Meets AWWA Specification D102-55T, Sec. 5.4.6.

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3. SOLUTION: *Allied Chemical 34Yc Coating* (#134) A plasticized thixo-tropic, coal-tar material meeting the U.S. Navy, Bureau of Yards and Docks Specification No. 34Yc. Combats corrosion due to salt spray and other reactive conditions—piers, ships, service vessels and offshore installations.

4. SOLUTION: *Allied Chemical Service Cement* (#160) A mastic type coating with high-grade, coal-tar pitch base, plastic material. You don't have to prime for torch field welding. Use it with our Pipeline Fabric. Meets Specification SSC-153, Type II.

You name the area and there's a *Job-Matched* Cold Coating ready to be brushed or sprayed on without heating or activators. Properties include chemical resistance, heavy coating thickness per coat and fast drying.

PLASTICS AND COAL CHEMICALS DIVISION
40 Rector Street, New York 6, N. Y.

Allied Chemical

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Take 33 workers—and chances are at least one is an alcoholic. It's an old problem that drains your profits, his happiness.

The Alcoholic:

It's high time you faced it: Those hidden alcoholics in your plant are costing you plenty. Here are some clues that will help you deal with this hard-to-handle problem.

COMPANY X has a hole in its pocket. About 25 of every 1000 of its employees are alcoholics. The company loses $1000 a year per problem drinker. The total annual bill comes to $8,750,000. But more than half of these sufferers could be helped—could be brought back to full productivity and good health—for a fraction of the present annual cost to the company.

That's what the final report of an independent survey told the management of Company X. Now the company is doing something about its problem. And other companies are taking similar steps in an effort to combat alcoholism—one of the most insidious threats to worker health and corporate well-being.

Just what is an alcoholic? He's a man whose drinking damages his health, impairs his personal relations, reduces his work efficiency and dependability. He may be anybody—a key executive, a skilled worker, a laborer, an engineer.

Tomorrow's alcoholic is today's problem drinker. He probably isn't a skid-row drinker. As a matter of fact, the problem drinker is cagey. He's hard to spot. At home his family and friends hide him. On the

By ARTHUR H. CAIN, Director
Research Division
E. J. Ade & Company, Inc.
New York City

Who He Is, How You Can Help Him

job, fellow workers, foremen, and management shield him. He is sick. He suffers from a serious disorder. Unless he gets treatment, he becomes progressively worse.

TOUGH TO GET FACTS

You can help the problem drinker. And he is worth helping. You can verify both of these beliefs in companies that have adopted both of them. But it isn't easy to get the facts. Some companies have made the reasonable assumption that their workers don't differ from other large national groups. They have gone ahead with medical and educational programs. Allis-Chalmers, Du Pont, Eastman Kodak, Corning Glass, and Consolidated Edison (in New York City) are a few of the companies that have found significant savings in dollars and cents (and in the immeasurable reduction of human suffering) in programs for alcoholics.

These corporations just took it for granted that they had problems of industrial drinking on their hands. They proceeded to take preventive and curative action. Their positive findings on alcoholism in the plant, without exception, came after they had set up their programs. But these programs were not patterned on the results of preliminary surveys. This amounts to putting the cart in front of the horse.

Why no fact-finding surveys? Some of these companies thought it would be a waste of time to make a survey. They knew they had problems and they set about solving them. Other companies felt that doing a survey in industrial alcoholism might be dangerous. Their attitude was this: Wouldn't hornets' nests be stirred up all over the plant? And even outside the company, in the eye of the public? Alcoholism researchers have long recognized such problems in survey work. They've been anxious to find a company that would permit a tryout of techniques for calculating the severity of a company's alcoholism problem. Such a company was Company X.

Company X is big. It employs 1000 people in New York City. It employs another 6000 in the New York City area. The entire corporation employs more than 35,000 in the United States and Canada.

Company X officials agreed to a preliminary survey in alcoholics for its employees. The survey was made in the New York City facilities of the company. Results were compared with a sample of the other employees in the metropolitan area.

THREE MEASURING HELPS

Usual employee survey techniques are of little use in a study of alcoholism. A questionnaire, for example, is a poor tool for unearthing problems as carefully hidden as alcoholism. Three techniques were developed during the survey at Company X. They have since been refined, but the basic method is:

1. Making comparisons—One way to estimate the extent of alcoholism in a particular plant is to back into the problem. See if the plant population is similar to populations from which reliable alcoholism data have already been derived. For example, the national percentage of alcoholism is estimated to be 3%. If the plant population is a cross-section of the nation, its per cent of alcoholism will also be 3%, or close to that figure. Better still, your company workers can be compared with workers of companies who have established alcoholism programs, where the percentage of problem drinkers is established.

Then there are geographic factors to consider. Problem drinking is heavier in some areas of the U.S. than it is in others. Urban drinking is higher than rural drinking. Racial, ethnic, and religious backgrounds of workers are important factors. Some groups are very high, relatively speaking, in their incidence of problem drinking. Others—those of Jewish background, for example—are very low.

Below are nine points of comparison for alcoholism in the workforce. They furnish clues for further investigation of the extent of your plant alcoholism problem. Baselines for comparison come from the Yale Center of Alcohol Studies (New Haven), from companies with established programs in alcoholism, and from the researcher's commonsense estimates of what's unusual.

- Stability of population. Is the company workforce heavily migratory? Is the turnover rate high? Is the employment seasonal? If so, you can expect more than the usual 3% alcoholism problem.
- Rural-urban population. There are 929 alcoholics per 100,000 adults in urban areas throughout the nation, according to the Yale Center. But there are only 509 alcoholics per 100,000 adults in rural areas. And alcoholism is also related to the size of the city. It's 33.7% higher in large cities (over 100,000 population) than in small cities. It's 105% higher in large cities than in rural communities.
- Field of industry. Look for the unusual in your company's work. Big differences exist among industries. For example, agriculture, forestry and fishing have a 2.2% alcoholism rate. Manufacturing leads the parade with 31.4%. Wholesale & retail trades are at 14.4%.

Turn the page

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THE ALCOHOLIC WORKER

Begins on page 244

• Skill of workers. Chances are that if your workforce is predominantly composed of skilled workers you'll have a harder time spotting alcoholism than you would if you had mostly unskilled workers. You can assume that alcoholism among the skilled tends to be carefully disguised—and more expensive to you as a result. Since the companies now running programs in alcoholism fall into the first category, not much is known about the exact alcohol pattern among largely unskilled workforces. Nor can the cost be accurately estimated per thousand at this time.

• Company size. This factor should be juggled mentally with the urban-rural comparison. Large companies tend to be located in highly urban areas. But some have rural plants that are heavily staffed with personnel who have been transferred from highly urban areas. There could be a relationship here that would merit further investigation.

• Male-female workforce. There's a greater incidence of alcoholism among men than women. But women hide alcoholism more carefully than men. If your plant has a high percentage of female workers, special study may be required on this factor.

• Age groups. The greatest incidence of known alcoholism is among people (of both sexes) in the 35 to 45 age bracket. If your plant population is unusually heavy with people in this age group, your alcoholism problem may be aggravated.

• Nationality groups. A delicate subject, but there's no doubt some groups are unusually high, others unusually low in alcoholism. And it may vary with location in the country. Best bet is to decide if the plant population is unusual, then use commonsense and general community knowledge to estimate the effect on your plant alcoholism.

• Geographic location. Aside from rural-urban considerations, plant location could be an important factor. If your plant area has a reputation for either unusual temperance or heavy drinking, it may affect your alcoholism problem. Following is a table that shows the concentration of alcoholics (per 100,000 population) in cities in the United States. These figures demonstrate the variation that

ADAMS CATALOG FILE

These Bulletins will help you solve your compressed air and liquid filtration problems.

For more than twenty years, the R. P. Adams Co. has worked with engineers to improve compressed air and simplify liquid filtration. The following literature reflects this wide experience — why not take advantage of this know how — write for your copies today?

Air and Gas Aftercoolers and Cyclone Separators

. . . provide effective low cost moisture removal from compressed air and gasses. Wet compressed gasses must be freed of damaging moisture before they can be safely used in air operated tools, equipment and instruments or other applications. The counterflow, water-in-the-shell design affords highly efficient vapor condensation. Models are available for cooling the gas to within 10° or 2° of the cooling water — dependent upon the dryness required. The Cyclone Separator then effectively removes condensates over a wide range of flows. This combination assures you of moisture free — trouble free compressed air and gas with less than ½ P.S.I. pressure loss. Models are available from 60 - 44,000 CFM in working pressures up to 1000 P.S.I.

Write for ..... Bulletin 713

Poro-Stone Air Filters

. . . can eliminate tool malfunction, instrument failure and contaminated products caused by foreign material in compressed air or gasses. Centrifugal separation and efficient Poro-Stone filtration combine to remove all pipe scale, dirt, and entrained oil and water with less than ½ P.S.I. pressure loss — ranges from ⅜" to 4" pipe size, from 15-700 CFM. Models in 150, 300 and 500 P.S.I. Get the complete facts on how to protect your compressed air system and related equipment.

Ask for ..... Bulletin 117

Adams Chemical Filters

. . . provide an effective method of solids removal. Completely enclosed construction coupled with dynamic back wash design provides contamination free — low cost separation. The availability of a variety of filter media meets the needs of any process. A wide selection of materials of construction—including lead and rubber linings — models in jacketed construction — can be supplied in various sizes and capacities. Investigate the many benefits of the Adams Chemical Filters.

Write for ..... Bulletin 431

Adams Industrial Filters

. . . are ideal for the filtration of process liquid and gasses as well as polishing industrial water and waste. An assortment of filter elements to provide efficient filtration for virtually every industrial application are available. Sizes are made to suit any process requirement. For complete details of how Adams filters can reduce your processing costs, write for ..... Bulletin 651

Where automatic water filtration is required, request ..... Bulletin 909

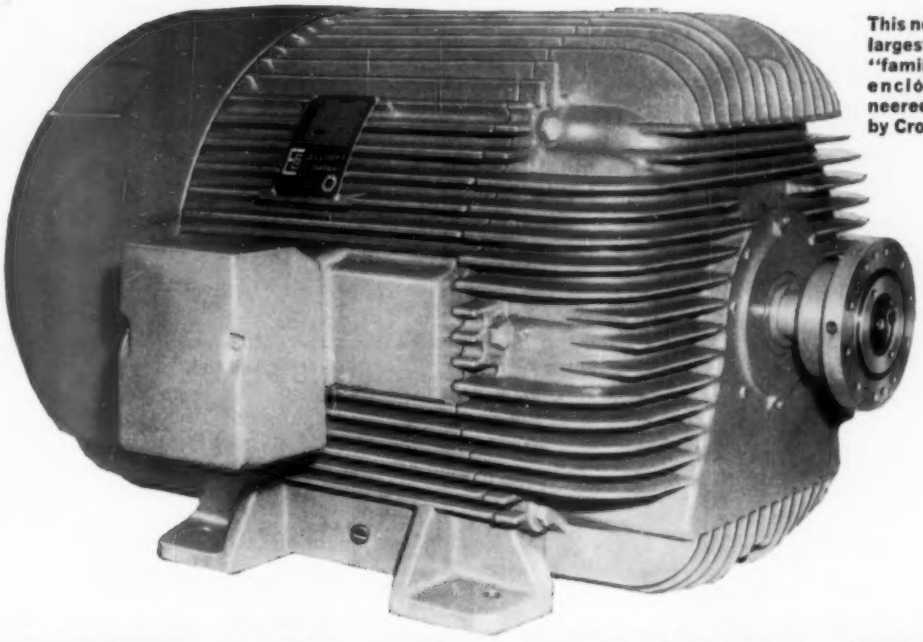
R & D — Pilot Plant Filters

. . . are available as self contained filter packages—including pre-coat equipment. The JWF-28, completely assembled and mounted on a skid, is available for pilot, research and development or for small process applications involving flows up to 80 GPM. You make only three connections. For complete information, write for ..... Bulletin 610

R. P. Adams Co., Inc., 215 East Park Drive, Buffalo 17, New York.

Circle 600 on Reader Service Card

BETTER COOLING MEANS LONGER LIFE LESS MAINTENANCE



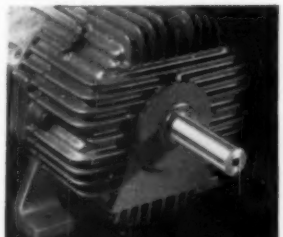
This new 300-hp unit is the largest of the Elliott C-W "family" of ribbed-frame enclosed motors, pioneered in the United States by Crocker-Wheeler.

ELLIOTT C-W SEALEDPOWER MOTORS

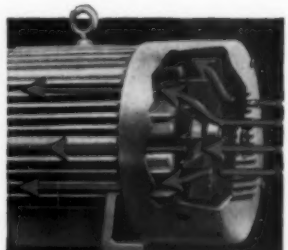
The numerous thin, deep ribs of Elliott C-W SEALEDPOWER Motors are the most advanced development of the ribbed construction, pioneered in the United States by Crocker-Wheeler. Modifications of SEALEDPOWER totally-enclosed fan-cooled motors include explosion-proof designs in all ratings up to 300 hp. Either open greasable or pre-lubricated bearings can be furnished.

Highly-effective sealing prevents entrance of moisture, dust, dirt, corrosive materials; consequently these motors can be depended upon for long, trouble-free service.

In numerous cases, SEALEDPOWER motors are proving to be more economical than standard open motors because of their low maintenance and dependability.



Extra fins keep bearing cool. This potential trouble spot is effectively cooled by the generous extra fins seen in the photograph above.



Cooling blast hugs frame. Air is directed along fins extending entire motor length. Easy to clean — no enclosed cooling passages to clog up.

ELLIOTT Company

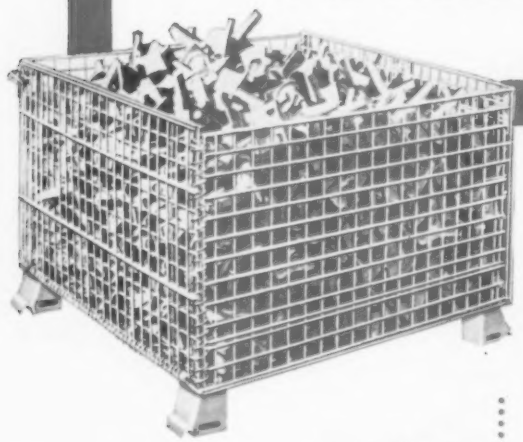
CROCKER-WHEELER PLANT JEANNETTE, PA.

Newest data on modern enclosed motors—including explosion-proof—is given in Elliott Bulletin PB 6000-2. Send for free copy today.

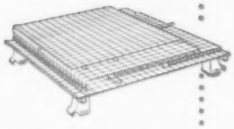
For more facts Circle 601 on Reader Service Card

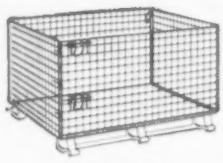
what's your..?

CARRYING CHARGE

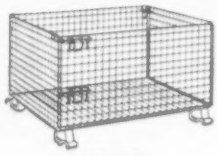


6,000 pound unit loads are efficiently and economically handled in USP Palletainers—and, empty Palletainers can be "flat-folded" for space savings and lower return rates.

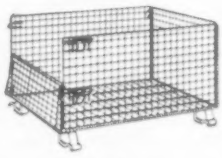




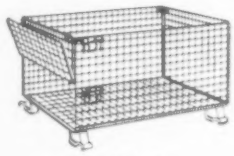
Bearing Plate



Hi-Lode



Warehouse



Bulk-Lode

What's it costing you to handle materials to and from production or assembly lines, in and out of storage, truck loading and transporting? There is an *easy way* . . . a practical, economical way with versatile USP Palletainers.

Palletainers have simplified materials handling for thousands of plants in scores of industries. And, these practically indestructible containers can save you valuable time and money both in and out of your plant. Whether you're processing, storing or distance-hauling, Palletainers provide the practical answer. Available in four basic types and a broad range of practical standardized sizes. They're engineered for safer handling, ceiling high stacking, faster 8-way entry for fork truck plus the advantages of content visibility for speedy inventory.

See 'em on Display!

Visit Booth 500 — June 9th - 12th
1959 Materials Handling Institute Exposition
Cleveland, Ohio

PALLETAINERS®

manufactured only by:

UNION STEEL PRODUCTS CO.
ALBION, MICHIGAN

exists in different geographic areas of the country.

City	Alcoholics per 100,000
San Francisco	4190
Boston	2020
Los Angeles	1990
Cleveland	1880
Washington	1760
Chicago	1740
Philadelphia	1730
Pittsburgh	1700
St. Louis	1620
New York	1550
Detroit	1450
Baltimore	1280

2. Researching the records—With rough estimates of alcoholism made on the basis of the nine comparisons outlined above you can make further checks with the help of company records. The intent of these record checks is to verify the results of the alcoholism estimate already made. Later, if a program is installed, suspect cases may be further investigated, with treatment in mind.

Absences, especially on Monday, are a good tip-off. Authoritative estimates place days lost due to alcoholism at 22 per man a year. This rate is more than double that for all other causes. (Allis-Chalmers reports that 8% of the working time of its 71 known alcoholics was lost due to this disease. Eight months after the alcoholism counselor took over, alcoholic absenteeism had dropped to less than 3%—less than the rate for all other causes.) It would be safe to say, then, that 20 to 25 "suspect" days lost per year is a good rule of thumb in reviewing records for alcoholism.

Chronic colds requiring sedative medication often aren't colds at all. These people may be alcoholics.

Employee safety records can furnish a clue to alcoholism. Repeated accidents are often caused by alcohol or the hangover that follows.

3. Probing those who know—There are people in the plant who have their thumbs on the alcohol problem. They know who some of the alcoholics are. Trouble is, they won't talk unless they're convinced the researcher is there to help. They won't talk if there's any danger to their friends with the alcoholism problem. In the study of Company X, researchers first convinced the company nurse and a member of

Planning that looked far ahead

P. LORILLARD COMPANY'S award-winning plant

This plant covering over 600,000 sq. ft. produces famous Old Gold, Kent and Newport cigarettes in a completely automated process. Its most modern "climate control" involves refrigeration capacity equal to 120,000,000 lbs. of ice per year.

Architect and Engineer:
LOCKWOOD GREENE ENGINEERS INC., New York, N. Y.
General Contractor:
H. L. COBLE CONSTRUCTION COMPANY, Greensboro, N. C.
Air-conditioning Contractor:
BUENSOD-STACEY, INC., New York, N. Y.
Piping Contractor:
GRINNELL COMPANY, Charlotte, N. C.
Plumbing Contractor:
DIXON & CHRISTOPHER, INC., Greensboro, N. C.

equipped throughout with JENKINS VALVES

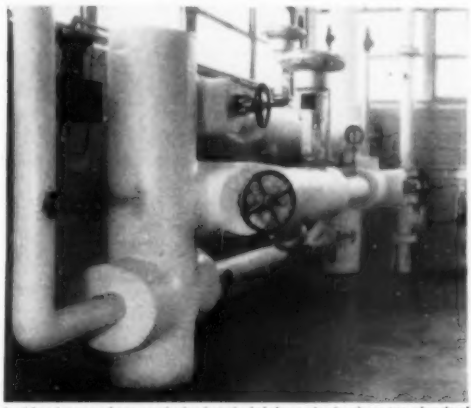
One of the ten "Top Plants of 1956*", the Lorillard plant at Greensboro, N. C. is notable from any standpoint but especially for planning that looked far ahead.

You see it everywhere. In exterior surfaces of brick, aluminum and marble that need almost no maintenance. In walls of glazed tile and floors that are concrete or hard surfaced to reduce cleaning.

You see it in the standardization on Jenkins Valves to assure that costly valve maintenance and replacement will not develop in future years.

To plant and building owners and the experienced men who design and construct for them, the specification "JENKINS" has been an unquestionable assurance for almost a century. You will want to have this assurance of long, trouble-free service when you specify or install valves, especially since Jenkins Valves cost no more. Jenkins Bros., 100 Park Ave., New York 17.

Sold Through Leading Distributors Everywhere

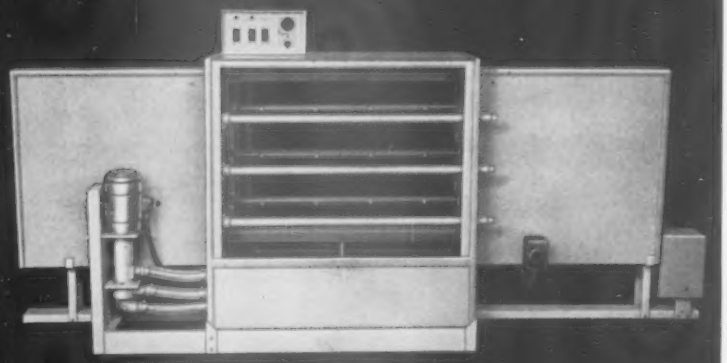


Jenkins bronze, iron, cast steel and stainless steel valves are standard in this modern plant. Shown is a typical installation on the main water supply line.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros

**As selected by a leading business publication*

Unique Fabrication Shows Versatility of VAN-COR PVC



Production Etcher for Printed Circuits, made by Centre Circuits, Inc., State College, Pa.

To resist acid corrosion, this etcher is primarily made of Van-Cor PVC pipe, fittings, (standard and specially machined), valves, sheet (transparent and regular), and joining strips.

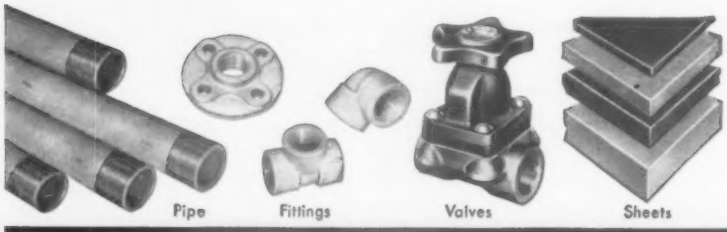
HOW CAN VAN-COR SERVE YOU?

Van-Cor PVC has many applications for plant use, or in your end product. It is ideal for plating equipment, filters, flux spray booths, chemical treatments, bleaching operations, glass polishing, and corrosive fume handling in general.

ADVANTAGES OF VAN-COR

1. Resists Corrosion of Industrial Acids & Alkalies
2. Light in Weight (½ that of Aluminum)
3. Easily Installed; High Tensile Strength; Low Flow Resistance
4. Readily Formed, Machined, Threaded and Welded

Write for Catalog and Name of Nearest Distributor



INDUSTRIAL DIVISION OF...
COLONIAL PLASTICS MFG. CO.
Subsidiary of THE VAN DORN IRON WORKS CO.
2685 EAST 79TH STREET CLEVELAND 4, OHIO

THE ALCOHOLIC WORKER

Begins on page 244

Alcoholics Anonymous that they were there as friends of the alcoholics. Their cooperation helped verify the estimates the researchers had made.

Since this study, additional means of evaluating the extent of alcoholism in companies have been developed. Police records, local taverns, local alcoholics groups, community social service agencies, and hospitals can now be used in surveys for alcoholism. It's best to have professionals do alcoholism surveys. They are most familiar with the problem and they can guarantee anonymity to their informants and follow their surveys with treatment.

HOW TO SPOT SYMPTOMS

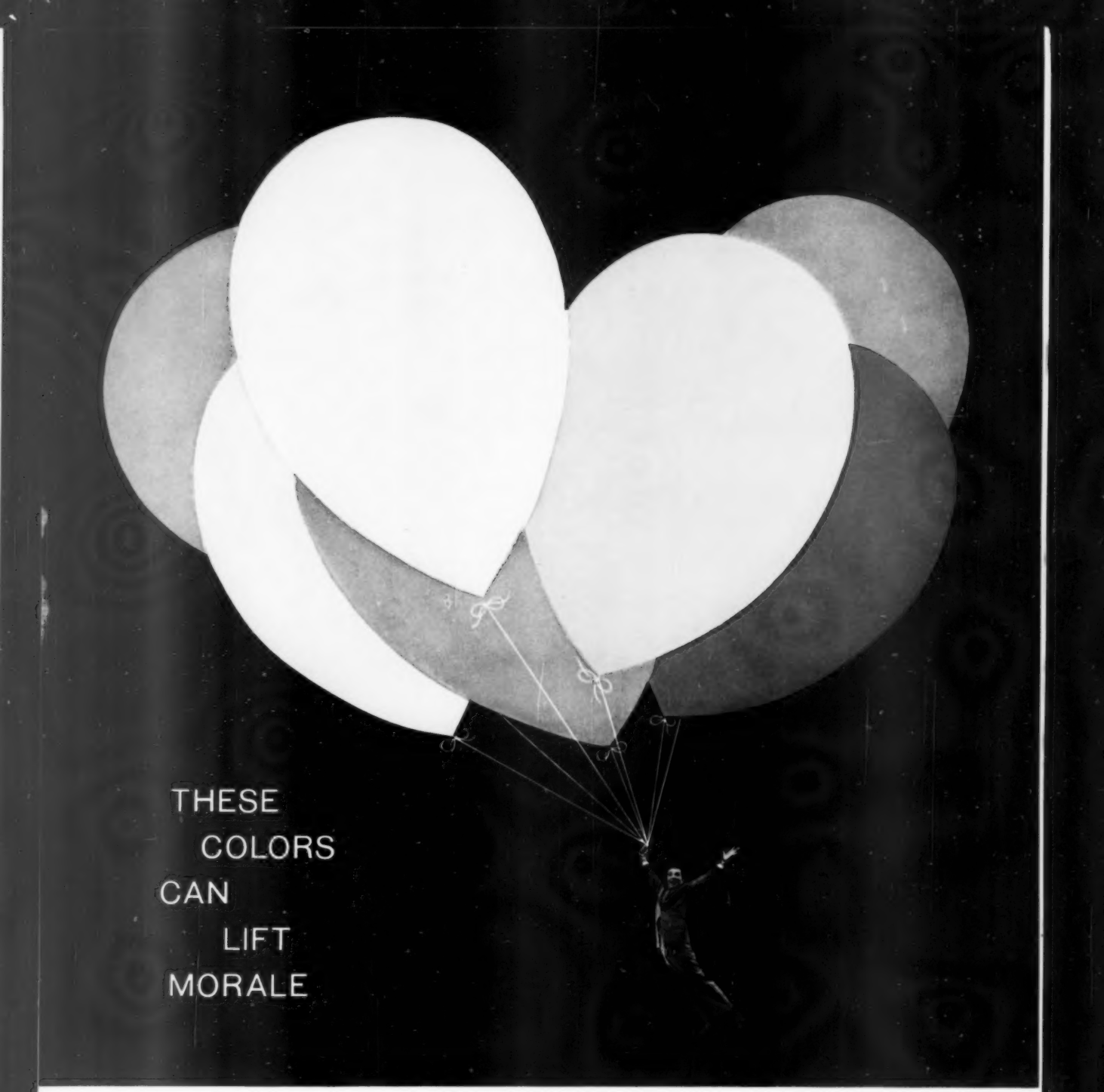
You can do your part in reducing losses that alcoholism causes in your plant by doing two things: Learn to identify the symptoms of problem drinking and direct the sick person to competent guidance before the problem becomes insoluble. Some of the more flagrant signs are:

- Frequent Monday morning absence, especially if someone else calls in to report his "indisposition."
- Sudden, marked changes in personality traits (unusual bursts of temper or irritability, unexplained periods of moroseness or moodiness, sharp changes from elation to depression or *vice versa*).
- Noticeable trembling of hands.
- Poor coordination.
- Drops and spurts in productivity.
- Tendency to give elaborate excuses for absences, tardiness, and accidents; or to stress grievances.

Warning— The above symptoms are possible signs of problem drinking. They could also signify other emotional or physical difficulties—or could mean nothing at all. Your role should be that of alert, sympathetic friend and observer—but not expert diagnostician. Leave that part to the professional.

Your value—both to the company and the sick worker—rests in your voluntary goodwill in tactfully directing the worker to competent counsel and medical or psychological aid—if it is needed and wanted. You can get full information from your local affiliate of the National Council on Alcoholism. **END**

For more facts Circle 604 on Reader Service Card
For more facts Circle 605 on Reader Service Card ➤



Maintenance painting in industrial plants should begin with top-quality paints. Du Pont Paints, for example, represent long-term savings in wear, appearance and satisfaction.

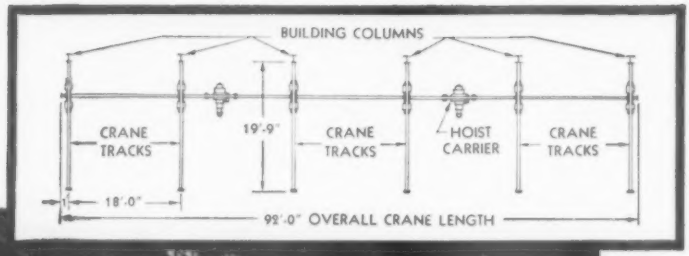
Another thing. The right colors can help to improve morale. Du Pont's scientific system of Color Conditioning puts the power of color to work for you—easing people's minds, helping them to relax, boosting their spirits.

For expert technical help on color selection and types of paints, turn to Du Pont. This service is free. So is the 28-page booklet, "How to Put Color to Work." Write: E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Dept. FM-96, Wilmington 98, Delaware.

DU PONT

Better Things for Better Living
...through Chemistry

DU PONT COLOR CONDITIONING PAINTS



This Cleveland Tramrail installation permits unobstructed operation of other conveyances above and below the Tramrail tracks.

CLEVELAND TRAMRAIL 92′-0″ CRANE OPERATES ON **SIX JIB TRACKS**

AN unusual Cleveland Tramrail crane installation serves the punching and spacing table in the structural shop of Omaha Steel Works, Omaha, Nebraska.

A 92-foot long crane extends the length of the table and operates on six jib tracks secured to the building columns. The tracks are supported near the middle and the end by tie rods.

The crane is power-driven and has two hand-propelled carriers with three-ton electric hoists. Conductors are SAFPOWRBAR® which assure maximum safety and reliability.

The Tramrail installation permits a heavy overhead crane to travel above and is devoid of special track support columns which would restrict movement of materials. The hoist carriers can be traveled quickly to any point on the crane and handle beams on the floor or machine. Beams of any length are easily maneuvered with the two hoists.

Thousands of plants are using Cleveland Tramrail in a multitude of ways to effect important savings. For any overhead materials handling problem, you will find it to your advantage to consult with Cleveland Tramrail sales engineers.

WRITE FOR FREE COPY of Engineering and Data Booklet No. 2008. Packed with valuable information. Profusely illustrated.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

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For more facts Circle 606 on Reader Service Card

Clean, sanitize, and Jenolize without fumes, flame, or excess water . . .

New All-Electric Hypressure Jenny!

Anywhere that flame, fumes, or excess water are objectionable or hazardous, the new Model E-350 All-Electric Jenny® will solve the cleaning or sanitizing problem. And with the new Jenolizing Process, machinery, equipment, and parts are left with a coating that protects against flash rusting, and gives a glossy, like-new appearance to painted surfaces.

Model E-350 combines the right amounts of heat, pressure, and cleaning solution to handle the majority of cleaning jobs at savings of up to 80% in time and labor costs. Its compact size, portability, low water output, and quiet operation without flame, smoke, or fuel fumes, make it ideal for use practically anywhere in the plant.

Send the coupon today for complete information. You'll welcome the outstanding performance of E-350—and the attractive plan which permits you to prove to yourself the economies of this new All-Electric Jenny.

Perfect for

manufacturing plants, food processors, textile mills, chemical and pharmaceutical plants, metal working and fabricating, petroleum industry, canneries, hotels and institutions, and every other operation where fumes, smoke, excess water are objectionable.

Mail Today!

Please send complete information on new E-350 All-Electric Jenny and Jenolizing.

Name ..... Title .....

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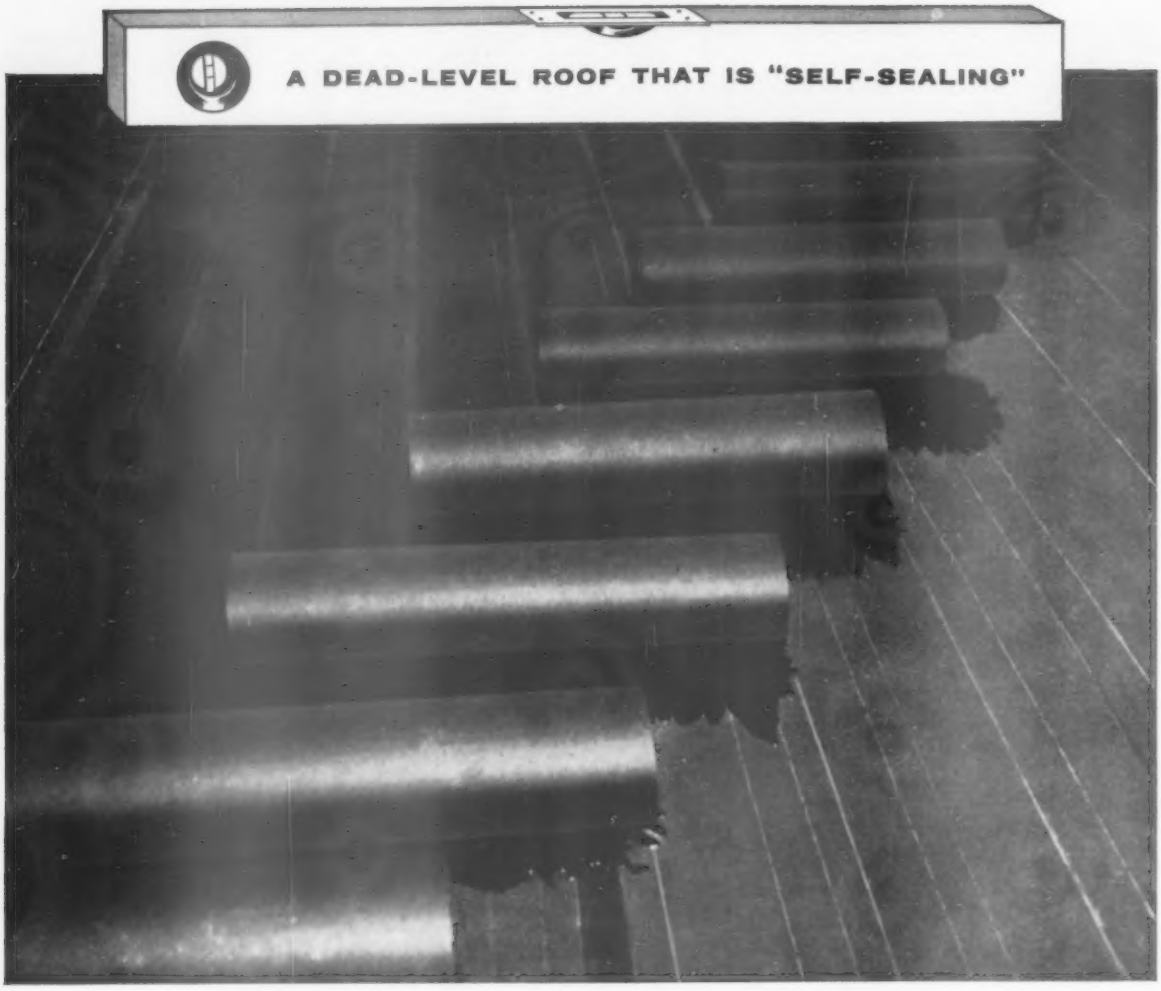
Address .....

City ..... Zone ..... State .....

HOMESTEAD VALVE MANUFACTURING COMPANY

Hypressure Jenny Division, P. O. Box 86, Coraopolis, Pa.



Johns-Manville *Aquadam* Built-Up Roofs

Built with a bitumen that means better application—longer life

AQUADAM IS A SUPERIOR CEMENTING AGENT developed by Johns-Manville for dead-level roofs. It combines the best features of coal tar pitch and of asphalt without their weaknesses. It quickly cements and securely seals the felts. And, as years roll on, Aquadam retains its self-sealing properties.

In addition, Aquadam offers these other proven advantages: ability to end "standing water worry"; high resistance to all kinds of weather conditions; "superior bond," because Aquadam spreads, wets and saturates the roofing felts uniformly.

For further information on how Aquadam Built-Up Roofs pay off in longer roof life and maximum protection send for a copy of booklet, "J-M Aquadam Built-Up Roofs." Write to: Johns-Manville, Box 158, New York 16, New York. In Canada, write Port Credit, Ontario.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

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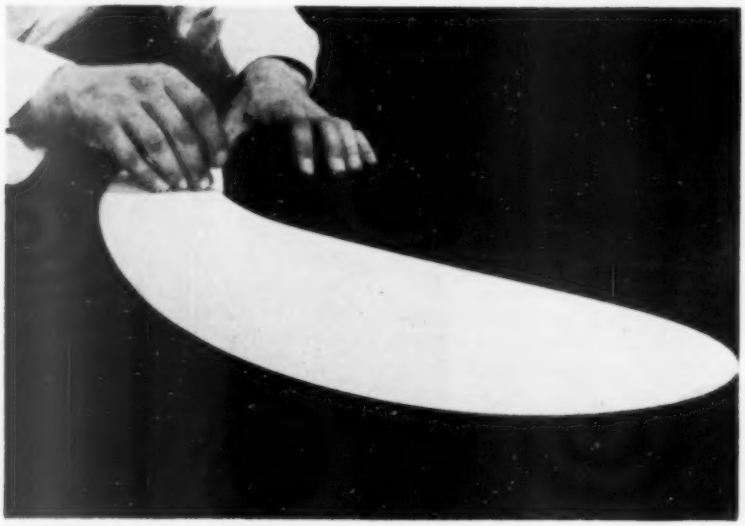
FACTORY

FACTORY MATERIALS NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.



NEW PROCESS CONVERTS TEXTILE FORMS INTO . . .

Graphite Cloth With Many Uses

Ever heard of graphite manufactured in textile forms? Yarns, braids, felts, or woven or knit fabrics can be converted to graphite with a purity in excess of 99.9%. The process? Electrical heating to temperatures approaching 5400 F.

Graphite textiles are resistant to acids, alkalis, and organic compounds, except those of a highly oxidizing nature, and are unreactive with many molten metals. The material has good electrical and thermal conductivity and is immune to thermal shock.

Combination of these properties and the textile forms now available should make the new graphite fibers and fabrics valuable in a variety of chemical, electronic, and mechanical applications. Potential uses include that of reinforcing agent for various plastics and refractory materials used at high temperatures or subject to thermal cycling. *National Carbon Co.* (Circle 251).

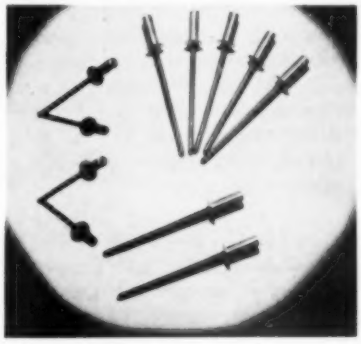
This Plastic Is a Flexible Magnet

Here's a flexible magnet said to have permanency superior to most conventional magnets. It's attracted to ferrous metals or to itself, and can be magnetized in any direction. Material is Koroseal vinyl plastic processed to react like metal or ceramic magnets. It can be produced in continuous lengths in an unlimited number of shapes ranging in size from spaghetti to garden hose. Can be cut without impairing its magnetic or electrical insulating qualities. *B. F. Goodrich Industrial Products Co.* (Circle 252).

253—Protective Heat Cloth is an aluminum sheet foil laminated on glass cloth fabric. Its flexibility makes it easy to use as curtain, shield, or panel. Comes 36 in. wide with panels buttoned together to make any length or height required. *Frommelt Industries.*

254—Polyisoprene Rubber does not come from a tree—it's a synthetic and said to be a duplicate of tree-grown rubber. Since it is made by a chemically controlled process, it is uniform in quality and of high purity. For tires, footwear, etc. *Shell Chemical Corp.*

255—Noise Control Paint applied to walls and ceilings absorbs sound waves, reduces noise. It's an alkyd-latex paint that contains sound-controlling granules. Can be used on almost any surface including concrete, primed metal, glass, wood. *Acoustic Chemical Corp.*



Easy-to-Use Rivets

For jobs where you can't get at the other side, here's a new type of blind "Pop" rivet. It's a high-strength, precision-made hollow rivet assembled on a solid mandrel. Can be inserted by operator and set with manual or powered tools. Jaws of tool pull mandrel into rivet until mandrel breaks. Produces light, vibration-proof clinch. *United Shoe Machinery Corp.* (Circle 256).

Turn the page

For more about these items, circle numbers on Reader Service Card next to back cover.

257—Silicone Potting Compound is transparent—permits visual checking of parts within a potted assembly. Dielectric Gel is a viscous water white liquid that readily surrounds components; its resiliency protects parts from shock and vibration. *Dow Corning Corp.*

258—Roof Protection System, called Tremglas, is a new type of material for renewing asphalt built-up roofs or repairing tar and gravel roofs. It's a strong, flexible white glass membrane that won't rot. Easy to apply—readily conforms to uneven surfaces. *The Tremco Mfg. Co.*

259—Metallic Static Seals, for use in hydraulic and pneumatic systems, combine excellent shelf life and reusability with effective sealing in temperatures from − 350 to + 1800 F. Standard sizes from ½- to 6-in. diameter, special sizes up to 60 in. *Cadillac Gage Co.*

260—Rubber Mold Casting has been simplified—just use a new two-component system. Components are mixed, cast, and cured at room temperature without shrinkage. For flexible molds, aluminum or steel tire molds, polysulfide rubber and other molds. *Smooth-On Mfg. Co.*

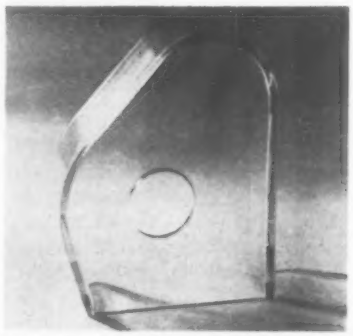
261—Plastic-Lead Putty, made of 94% lead and 6% plastic, can be formed into any shape without heat or pressure. Devcon L becomes a tough, durable mass similar to lead itself two hours after addition of hardening agent. For repairing lead-lined tanks, etc. *Devcon Corp.*

262—Textured Metal has non-directional, non-repeating, non-geometric pattern. This Leeds texture has an authentic stucco-like appearance. Eliminates necessity for matching; less waste when covering wide expanse such as building panels. *Ardmore Products, Inc.*

263—Silicon Carbide is a lightweight refractory material with high thermal shock and erosion resistance. Labeled GRB, the material is 60 to 90% silicon carbide and 10 to 40% solid, granular graphite. Various configurations can be formed. *The Carborundum Co.*

264—Silicone Rubber Compounds are color-coded to help identify encapsulated and potted materials. PA407 is a quick-setting, shrink-resistant liquid. Easy to prepare—comes in premetered kit that has 3 oz. of color-mixed compound, plus catalyst. *Plastic Associates.*

265—Non-Skid Paper, for bags or wrappings, has embossed surface for increased friction. This reduces slippage when bagged products, such as cement, are being stacked. Paper has a 3/32-in. double embossed pattern with interlocking square elements. *The Cromwell Paper Co.*



266—Crystal Clear Plastic, for applications where transparency is desirable, provides 90% light transmission, does not discolor, has low shrinkage. Can be cast by untrained workers, without complex equipment. For machine housings, piping, other uses. *Marblette Corp.*

MATERIALS LITERATURE

267—Foamglas Insulation. Catalog FB-105 has 20 pages of descriptive information on uses of cellular glass insulation. Technical data include specifications, charts, drawings, application photos. *Pittsburgh Corning Corp.*

268—Potting Compounds. This 8-page booklet discusses urethane elastomers for potting and encapsulating applications. Two systems are explained, as well as a typical method of urethane elastomer preparation. *Mobay Chemical Co.*

269—Curtain Wall System. Here's a folder of single-pagers covering the addition of transparent, functional, and color accent panels that give a "new look" to Thinlite curtain walls. Photos, drawings. *Owens-Illinois.*

270—Pipe, Vessel Covering. This illustrated 12-page catalog (Form 157) presents data on Styrofoam applications for low temperature insulation. Includes specifications, thickness standards, heat gain tables. *Dow Chemical Co.*

271—Corrugated Board. Stone-Cor, a heavy-duty, humidity-resistant board for shipping containers, is described in 4-pager. Tells how board gives good stacking strength. Test chart is printed on sample. *Stone Container Corp.*

272—Bearing Bolts. Advantages of new high-strength bolts are given in illustrated 2-page bulletin (No. H5BB). Lists structural bolt lengths. Gives design, applications, and other technical details. *Lamson & Sessions.*

273—Thermoplastic Colorants. This 4-pager on Drycol covers info for dry coloring of thermoplastics. Standard color key chart for polyethylene and polystyrene; directions for use of colorants. *Gering Products, Inc.*

Stapling breaks boatbuilder's bottleneck— cuts costs $27 to $30 per boat

It took two to three hours to attach a laminated fiber glass deck to a laminated fiber glass hull by the method previously used, which was a cemented mechanical bond.

Now the job is done with a powerful new Bostitch air-driven stapler and the two are joined in only 15 minutes. The squeeze of a trigger replaces predrilling and the slow tightening of the fasteners. Production is *ten times faster.* Savings range from $27 to $30 a boat.

The customer reports other stapling advantages. It's the *only* method that combines strength and flexibility. It prevents squeaks that might develop when bolts, rivets or screws are used, and there is no separation of seams due to vibration as sometimes happens with cemented joints. A less expensive rubber rub rail can be used to keep the stapled joint watertight.

There are 800 kinds of Bostitch staplers and over 200 types of Bostitch staples to break bottlenecks in factories, shops, offices and stores. A Bostitch Economy Man—one of over 350 in 123 U. S. and Canadian cities—will help you choose the right staples for your fastening jobs. To call him, look under "Bostitch" in your phone directory, or write us.

Fasten it better and faster with

BOSTITCH®
STAPLERS AND STAPLES

Bostitch, 606 Briggs Drive, East Greenwich, Rhode Island

I'd like to know if stapling can help increase our profits. I'm particularly interested in fastening (please check)

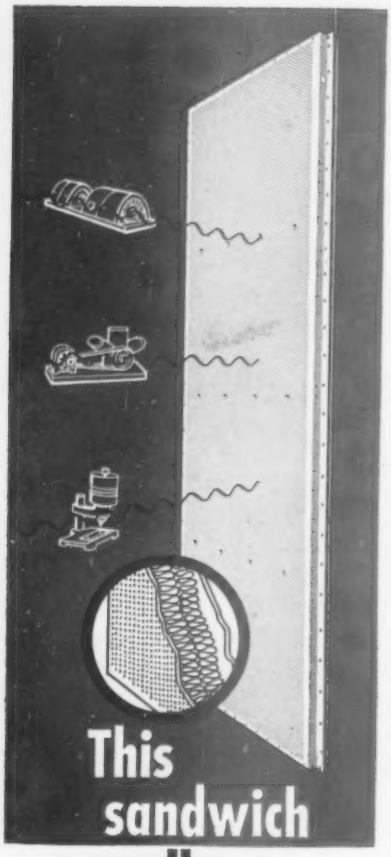
☐ wood ☐ plastics ☐ cartons ☐ leather
☐ rubber ☐ light metals ☐ fabric ☐ roofing

Name _____

Company _____

Address _____

City _____ Zone _____ State _____



swallows noise

This is an Eckoustic Panel — a very special sandwich, made of two layers of steel wrapped around a blanket of Fiberglas.

You can use it as a modular building block to build a soundproof room or plant office — a machinery enclosure — a production test facility — or, for that matter, practically anything where you must shut noise out, or seal it in.

Eckoustic panels protect employees from the harmful effects of exposure to continual noise . . . increase employee efficiency by creating more comfortable working conditions. And we have the results of acoustical studies which show they do it more effectively than other types of acoustical panels.

We also have a free folder that tells how Eckoustic Panels can help you solve sound control problems faster and more economically than you may have thought possible.

Let us send you the complete information without obligation.

Write:

THE Eckel CORPORATION

155 Fawcett Street, Cambridge 38, Mass.

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

MECHANICAL

346—Clutches. Complete data, with features, on over-running clutches available on request. Formsprag Co.

347—Chains and Sprockets. Catalog 1050 gives full information on conveyor, elevator type. Link-Belt Co.

348—Shaft-Mounted Drive. Bulletin 7100 lists sizes, capacities, ratios, torque capacities. The Falk Corp.

349—Motor Reducers. Bulletin 3100 gives complete mechanical features and applications. The Falk Corp.

350—V-Belt Fasteners. New bulletin (v-227) on custom made V-belts. Five sizes available. Flexible Steel Lacing Co.

351—Drives, Bearings. Bulletins on V-drives, chain and sprockets, rolling bearings. Dodge Mfg. Corp.

352—Speed Reducers. Bulletin lists line of torque-arm shaft-mounted speed reducers. Dodge Mfg. Corp.

MAINTENANCE

353—Paints. Free booklet, "Color Dynamics," gives complete factual information. Pittsburgh Plate Glass Co.

354—Paints. A 28-page booklet, "How to Put Color to Work," for reference. E. I. du Pont de Nemours & Co.

355—Lubricants. Booklet: "Management Practices That Control Costs Via Organized Lubrication." Texas Co.

356—Lubricants. Free data book gives useful treatise on lubrication. Lubriplate Div., Fiske Brothers Co.

357—Scrubber-Vacuum. Literature tells how to mechanize all scrubbing operations. Finnell System, Inc.

PRODUCTION

358—Honing Machines. Literature on new model. Variable speeds from 250 to 1400 rpm. Superior Hone Corp.

359—Ferrous Traps. Literature gives complete installation, application. Permanent, non-electric. Eriez Mfg. Co.

360—Recipro Saw. Free brochure (F-14499) contains full specifications and varied applications. Skil Corp.

361—Head Cylinders. Bulletin SQ 10-58 gives full mechanical data on new square head cylinder. Tomkins-Johnson Co.

362—Batching Equipment. Bulletin 2964 covers automatic remote control batching systems. Toledo Scale Co.

363—Power Tools. Catalogs on stud drivers, air tools, chain saws, electric tools, etc. Remington Arms Co.

364—Flexible Tubing. New data book shows applications, properties, sizes. Penna. Flexible Metallic Tubing Co.

365—Heat Exchangers. Bulletins 120, 124, and 125 have full information on heat exchangers. Niagara Blower Co.

366—Steam Cleaning. Here's complete data on all-electric cleaner and coating machine. Homestead Valve Mfg. Co.

367—Angle Nut Setters. Bulletin gives helpful data for solving close-quarter tightening problems. Gardner-Denver Co.

368—Solvent Degreasing. Free copy of paper: "The Truth About Solvent Degreasing." Detrex Chemical Industries.

369—Portable Broach Gun. Bulletin 581-2 describes features and new technique. Chicago Pneumatic Tool Co.

370—Controlled Air Devices. Idea file contains installation data, wiring diagrams, and applications. Bellows Co.

371—Tool Steels. List gives data on more than 125 technical publications offered. Allegheny-Ludlum Steel Corp.

MATERIALS HANDLING

372—Hoists. Bulletin H-20 tells mechanical features and data. Capacities: 250 to 2000 lb. Harnischfeger Corp.

373—Cranes. Bulletin C-6 is packed with photos and facts showing varied applications. Harnischfeger Corp.

374—Trolley, Crane Bridge. Crane catalog offers complete data with applications. Euclid Crane & Hoist Co.

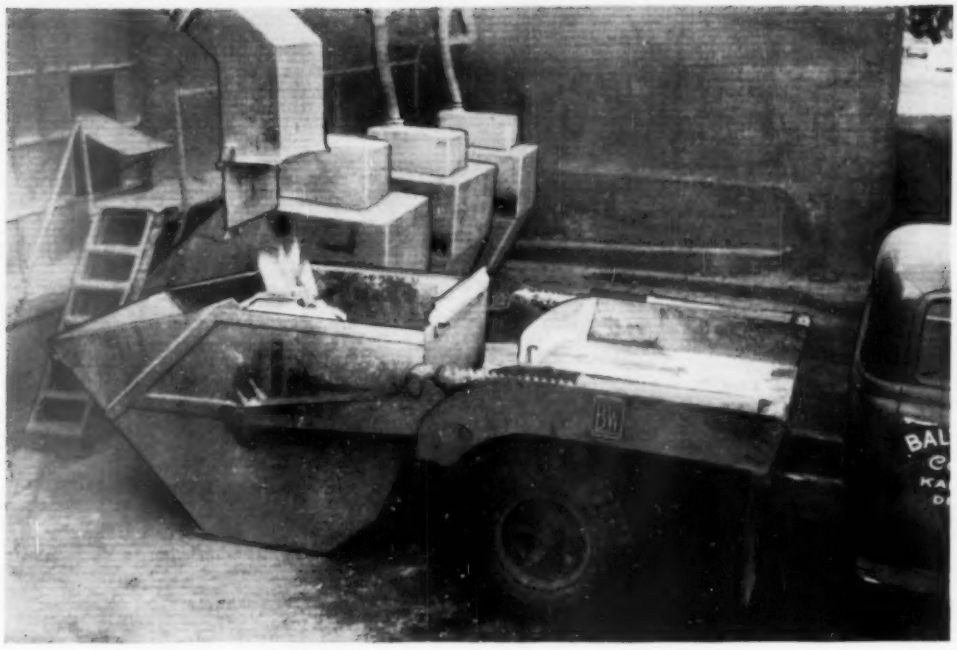
375—Overhead Conveyor. Illustrated catalog and planning folder with diagrams, grid sheets. Chainveyor Corp.

376—Magnets. Fact-filled 6-page folder on new permanent plate magnets for varied applications. Eriez Mfg. Co.

377—Industrial Locomotives. Literature describes diesel/gasoline 5- to 40-ton units. Rogers Bros. Corp.

378—Metal Lumber. Here's an idea-packed catalog on slotted angle for unlimited applications. Republic Steel Corp.

Turn the page



Big step forward in plant housekeeping

Load Lugger System solves difficult waste disposal problem for ceiling tile manufacturer

By tying the Load Lugger System of detachable containers in with a pneumatic dust and waste collection system, Baldwin-Hill Company's Kalamazoo plant has solved the problem of keeping plant and premises neat and clean, free of dust, chips and rejects generated along the production line.

Five Load Lugger containers receive the debris through hoses and chutes. In a single 8-hour shift, a single Load Lugger equipped truck and its driver dispose of all waste accumulated during two 8-hour production shifts. Periodic production shut-downs for "clean-up" have been eliminated. Production and quality is now maintained at a high level.

This installation typifies how the Load Lugger System contributes to more efficient plant operation, cleanliness and safety. You'll want the complete story—it may suggest ways in which the flexible Load Lugger System can increase housekeeping efficiency for your plant.

INGERSOLL KALAMAZOO B-W BORG-WARNER

Borg-Warner Corporation

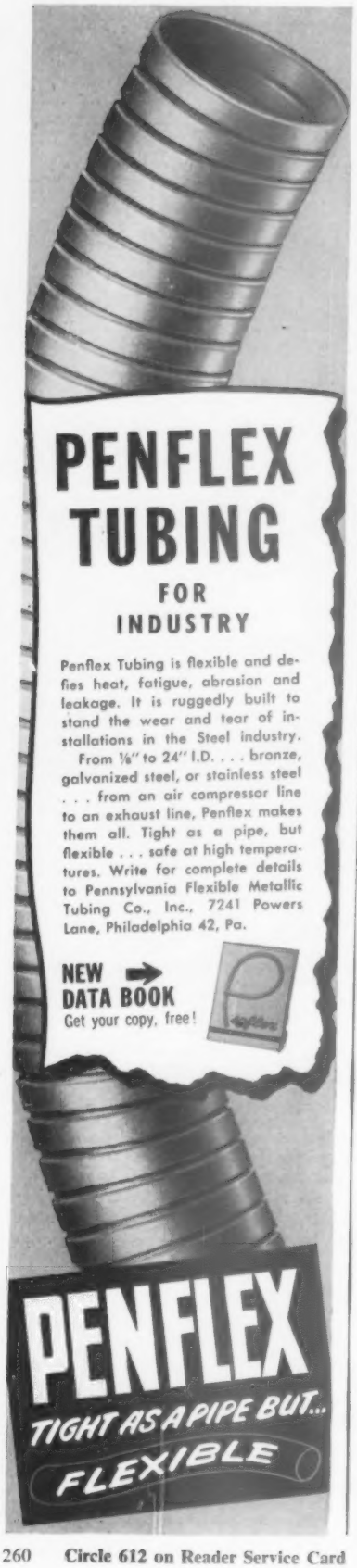
INGERSOLL KALAMAZOO DIVISION

1822 North Pitcher Street, Kalamazoo, Michigan, Telephone Fireside 5-3501

EXPORT SALES: BORG-WARNER INTERNATIONAL CORPORATION CHICAGO

SEND FOR THE BALDWIN-HILL STORY **TODAY.**

For more facts Circle 611 on Reader Service Card


PENFLEX
TUBING
FOR
INDUSTRY
Penflex Tubing is flexible and defies heat, fatigue, abrasion and leakage. It is ruggedly built to stand the wear and tear of installations in the Steel industry.
From 1/8" to 24" I.D. . . . bronze, galvanized steel, or stainless steel . . . from an air compressor line to an exhaust line, Penflex makes them all. Tight as a pipe, but flexible . . . safe at high temperatures. Write for complete details to Pennsylvania Flexible Metallic Tubing Co., Inc., 7241 Powers Lane, Philadelphia 42, Pa.
NEW
DATA BOOK
Get your copy, free!
PENFLEX
TIGHT AS A PIPE BUT...
FLEXIBLE

ADVERTISERS' LITERATURE

Begins on page 258

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

379—Steel Pallet Racks. Complete descriptive literature has specifications and quotations. Republic Steel Corp.

380—Tote Boxes. Catalog gives data on tote-box line, other materials handling equipment. Wear-Ever Aluminum, Inc.

381—Lift Trucks. Free booklets on 14 types of lift trucks contain full information. Yale & Towne Mfg. Co.

382—Slings. New handbook gives types, dimensions, weights, rated loads, proper fittings of slings. Union Wire Rope Co.

383—Heavy-Duty Truck. Bulletin gives complete details and data on new type of truck. The Raymond Corp.

384—Batteries. Illustrated 8-page brochure (No. 6230) describes new ironclad batteries. Exide Industrial Div.

385—Steel Shelving. Catalog describes features of simple, flexible, rapid assembled shelving. Borroughs Mfg. Co.

386—Storage Racks. Literature explains features of open-end adjustable storage racks. American Metal Products Co.

387—Walkie-Type Trucks. Illustrated 16-page booklet contains facts and figures. Automatic Transportation Co.

PACKAGING, SHIPPING

388—Paper Bags. Free booklet FM-111 gives complete information and applications. Union Bag-Camp Paper Corp.

389—Packaging Machinery. Bulletin 101-59 provides helpful data on packaging applications. J. L. Ferguson Co.

390—Staplers, Tackers. Bulletin FT-50 gives full details and application data on this line. Fastener Corp.

ELECTRICAL

391—Enclosed Motors. Bulletin PB 6000-2 gives full data—including explosion-proof motors. Elliott Co.

392—D-C Drives. Free copy, "Why D-C?" describes capabilities of direct-current power. General Electric Co.

393—Control Centers. Bulletin 2-2000A has complete details and mechanical data. Federal Pacific Electric Co.

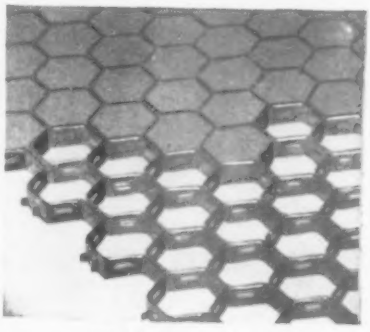
394—Motors. Literature contains data and applications on line of motors. Capacities: 1-600 hp. Brook Motor Corp.

Turn the page

"GRIDSTEEL" Pays for itself!

...You save two ways with
IRVICO "Gridsteel"

1. Initial low cost
2. Reduction of floor maintenance costs



"Gridsteel" protects floors from the damage normally caused by impact, skidding, vibration and heavy traffic. "Gridsteel" is made of steel bars on edge, joined together in a honeycomb mesh pattern. No potholes or ruts can form because any crack in the fill cannot spread beyond a single steel mesh.

"GRIDSTEEL"
will protect floors made of wood, concrete, or asphalt.

Write today for complete information. Ask for 20-page color catalog on "Gridsteel" Floor Armor

★

"A Fitting Grating for Every Purpose"

IRVICO®

IRVING SUBWAY GRATING CO., Inc.
Originators of the Grating Industry

Offices and Plants at
5026 27th St., LONG ISLAND CITY 1, N. Y.
1826 10th St., OAKLAND 23, CALIFORNIA

Circle 612 on Reader Service Card

Circle 613 on Reader Service Card

WIDE OPEN for Fast Wiring and Inspection

NEW complete line of low voltage motor control

Wide-open accessibility and modern design assure fast and easy installation, modification, inspection and maintenance of this new line of Size 0 through 4 Allis-Chalmers control. For instance, large and clearly marked terminals, pressure connections for all wiring, wide and deep-cut screw slots, clearly visible contacts, easy coil replacement, readable rating plates, "out-front" overload relays.

Flexibility

This new line of control permits making many modifications in the field with ease. Minimum parts requirements facilitate delivery from local stock.

Unsurpassed Mechanical and Electrical Life

Millions of "life-test" operations attest to the functional quality in every detail — assure the ultimate in dependable performance and sure protection for personnel, motors and machines.

A complete line of low voltage control (Size 0 through 8) and high voltage control *in all NEMA* enclosures, plus engineered control systems. Your A-C distributor or representative will give you all the details. *Or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.*

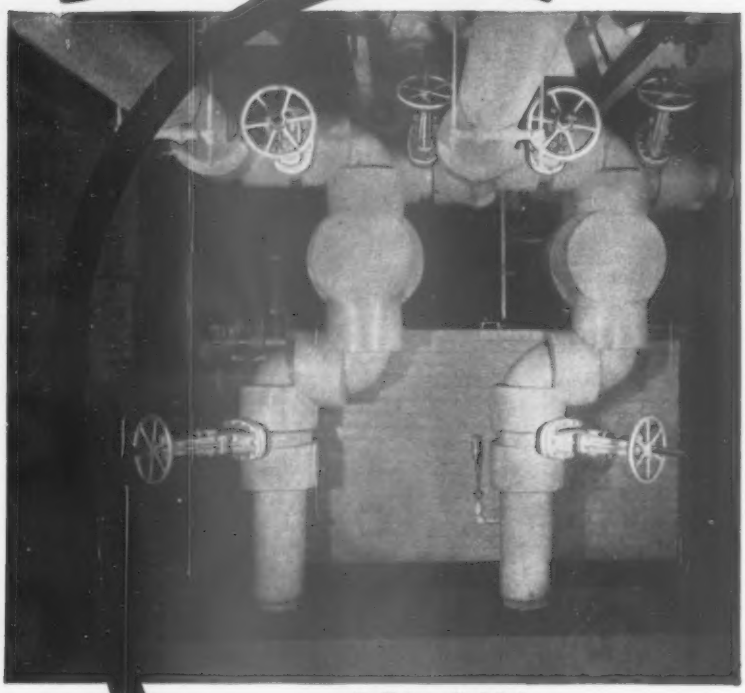
Plan to stay ahead... MODERNIZE!

ALLIS-CHALMERS

A-5984

For more facts Circle 614 on Reader Service Card

Proved DEPENDABLE



- Call it reliable!
- Call it rugged!
- Call it dependable!
- If it is a Fairbanks valve . . . it has it!

Thousands of installations under every condition from the simplest to the most difficult, prove Fairbanks valves give dependable service, require less maintenance, last longer — often succeed where other valves fail!

That is why you find more uninterrupted service, less shutdown, in plants that specify Fairbanks 125-pound Iron Body Gate Valves — the valves with proven dependability built in!

Fairbanks Iron Body Gate Valves are bronze mounted* both with inside non-rising screw and outside screw and yoke. Available with screwed or flanged ends. Bodies and bonnets made of high strength alloy cast iron. Wedges in 2" to 4" sizes of solid bronze; in larger sizes to 24", wedges are alloy iron with rolled in bronze face rings and bronze bushed stem connections. The threaded bronze seat rings are screwed into body at angle conforming to taper of wedge.

(*ALL IRON GATE VALVES ALSO AVAILABLE.)

THE **Fairbanks** COMPANY

393 LAFAYETTE STREET, NEW YORK 3, N. Y.

Branches: New York 3 • Pittsburgh 22 • Boston 10 • Rome, Ga.

TRUCKS • CASTERS • DART & PIC UNIONS • VALVES

ADVERTISERS' LITERATURE

Begins on page 258

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

395—Motor Starters. Bulletin SM-275 tells complete story on starters with thermal overload relays. Square D Co.

396—Trip Controls. New revised catalog 65A lists line, gives mechanical features. Micro Switch Div. of Honeywell.

397—Photoelectric Controls. Catalogs show wide selection, including latest in tubeless controls. Autotron, Inc.

CONTROL SYSTEMS

398—Data Processing. Illustrated Brochure F-2 gives full information on this system. Royal McBee Corp.

399—Schedule Board. Bulletin X-200 shows applications of visual control schedule board. Graphic Systems.

400—Photo Panels. Information and literature on photo panels available on request. Acme Visible Records, Inc.

PLANT SERVICES

401—Rust Preventives. Complete literature with applications and color charts is available. Rust-Oleum Corp.

402—Pipe, Fittings. Catalog describes properties, features, and varied applications. Colonial Plastics Mfg. Co.

403—Disinfectant. Literature discusses multi-purpose industrial floor disinfectant. C. B. Dolge Co.

404—Identification Camera. Brochure tells advantages for plant security. Fairchild Camera and Instrument Co.

405—Grating. This 20-page catalog gives information on "Gridsteel" floor armor. Irving Subway Grating Co.

406—Dust Collectors. Illustrated folder gives complete data on over 38 standard models. Aget Mfg. Co.

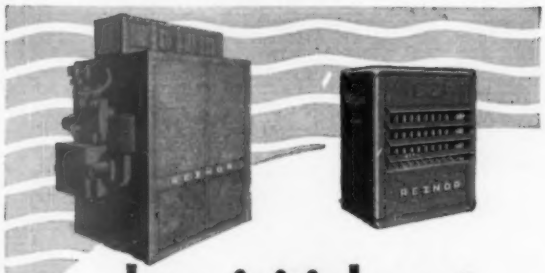
407—Washroom Advisory Service. Free booklet on principles of washroom design for better efficiency. Scott Paper Co.

408—Steel Equipment. Catalog lists and illustrates well-diversified line of equipment. Lyon Metal Products, Inc.

409—Hose Reels. Technical data and folder describes features and applications of reels. The Wayne Pump Co.

410—Towel Dispensers. Free literature tells cost-saving features of controlled towel dispensers. Steiner Co.

Turn the page



low initial cost

You get more heating capacity per equipment dollar with Reznor gas unit heaters because the heaters alone are all you need. Reznor heat is on-the-spot heat. You don't have the expense of piping or ducts to carry the heat from a remote heat source. That means savings on materials, and on installation too.

LOW INITIAL COST is just one of many reasons why Reznor gas unit heaters are right for so many plant heating jobs. These completely automatic packaged units also offer substantial savings on installation, operation and maintenance costs. Whether you need one unit to eliminate a "trouble" spot or enough units for a complete plant heating system, ask your Reznor distributor for details or write for your free copy of "Modern Heating".

Look for Reznor under "Heaters-Unit" in the Yellow Pages

REZNOR

WORLD'S LARGEST-SELLING DIRECT-FIRED **UNIT HEATERS**

Reznor Manufacturing Company, 89 Union Street, Mercer, Pa.

For more facts Circle 616 on Reader Service Card

---

35 new models!

E-Z LIFT

This complete new line of Lift Trucks has simply "outdone" all competition. They are built the sturdiest and priced lowest!! Available in battery operated or hand operated models.

1500 lb. cap.

$297.00

MODEL B

COMPLETE WITH HEAVY DUTY 12 VOLT BATTERY AND BUILT-IN CHARGER.

FREE—For complete new catalog and price list, WRITE DEPT. F

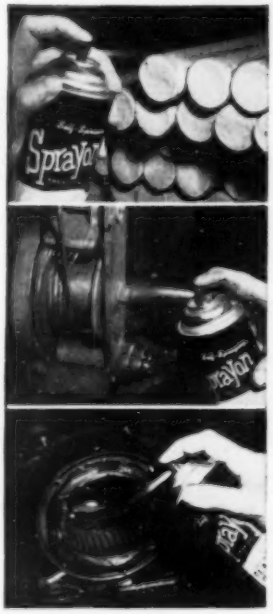
CROWN CONTROLS CO. INC.

For more facts Circle 617 on Reader Service Card

New!

Sprayon

AEROSOLS FOR INDUSTRY



The better, faster, cheaper way to do a hundred maintenance jobs!

Save time and labor—get better results with "push-button maintenance". First full line of aerosols covers virtually every self-spraying product used in industry, from silicone mold release to blue layout fluid. The complete Sprayon line includes a number of uncommon items—some of which may solve problems for you. Stocked by selected Industrial Distributors and mill supply houses. Manufactured by Sprayon—eldest and leading custom-loader of aerosol specialties.

COLOR CODE ENAMELS
MARKING PAINTS
EQUIPMENT FINISHES
SPECIAL LUBRICANTS
PROTECTIVE COATINGS
DEGREASERS

WRITE FOR FREE HANDBOOK

of 46 self-spraying maintenance and production aids.

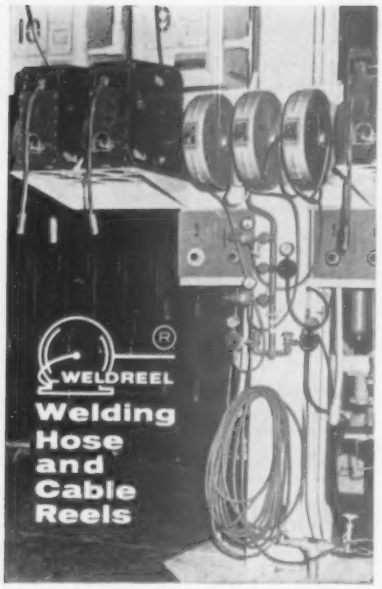
Keep this handy reference in your file.

Some key territories are open for industrial agents and distributors. Write for information.

Industrial Supply Division

SPRAYON PRODUCTS, INC. 2060 East 65 St., Cleveland 3, Ohio

For more facts Circle 618 on Reader Service Card



AT PHILLIPS PETROLEUM

Plant safety is improved—hose and cable life extended—good housekeeping is made simpler — in Phillips Petroleum Corporation's refinery at Borger, Texas, by keeping hose and cable off the floor when not in use — with WELDREEL hose and cable reels.

WELDREEL reels pay out freely and lock automatically at desired length. A slight tug releases the locking pawl, allowing hose or cable to be automatically retracted.

Designed to handle flammable fluids and gases safely in dual and single hose, leakproof WELDREEL reels are adaptable to a wide variety of industrial applications. Write for full information.

MODEL OA-A holds 50′ of 3/16″ or 40′ of ¼″ dual hose. Model OAB has capacity for 150′ of ¼″ or 125′ of 5/16″ hose.

MODEL EA-2 with current capacity of 300 amps holds 50′ of 2/0 welding cable. Model EA has capacity of 100′ cable.

MODEL A-1 has 50′ capacity of ¼″ or ⅜″ I.D. single hose. The larger Model A-2 holds 50′ of ½″ hose.

UNITED SPECIALTIES INC.
POST OFFICE BOX 698 EL DORADO, ARKANSAS

ADVERTISERS' LITERATURE

Begins on page 258

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

411—Adhesive Finish. Descriptive bulletin describes use of finish for dull, damp, or damaged walls. Swift & Co.

412—Unit Heaters. Free copy of "Modern Heating" gives full information and features. Reznor Mfg. Co.

413—Industrial TV Camera. Planning book describes new all-transistor TV camera for industry. Philco Corp.

414—Modular Work Stations. Bulletin 158 gives complete data on changeable bench layouts. Products For Industry.

415—Corrosion Prevention. Helpful literature discusses full line of bitumastic coatings. Koppers Co. Inc.

416—Mounting Pads. Bulletin gives complete information on machine mounting pads. Unisorb Div., Felters Co.

417—Signaling Systems. Here's a concise, informative booklet, "Industrial Signaling Log." Edwards Co., Inc.

418—Chemical Liquid Pumps. Bulletin 982-A explains handling corrosive, high-consistency liquids. Buffalo Pumps, Inc.

419—Non-Clogging Pumps. Bulletin 953-K covers split-shell pumps for high-consistency liquids. Buffalo Pumps, Inc.

420—Clear Water Pumps. Bulletin 955-R describes double-suction pumps for clear water service. Buffalo Pumps, Inc.

421—High Pressure Pumps. Bulletin 980-D on multi-stage pumps for boiler feed, clear water uses. Buffalo Pumps, Inc.

422—Air Compressors. Catalog No. 37 gives complete data: ¼ through 50 hp. Brunner Div., Dunham-Bush, Inc.

BUILDINGS

423—Abrasive Tread Plate. Application, design, fabricating data on non-slip tread plate. Aluminum Co. of America.

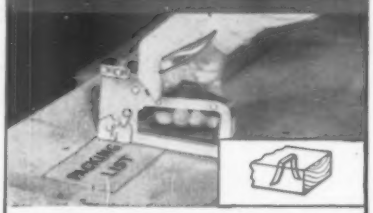
424—Complete Buildings. Brochure gives sizes and assembling information, other data. Republic Steel Corp.

425—Built-Up Roofs. Booklet, "J-M Aquadam Built-Up Roofs" available upon request. Johns-Manville Corp.

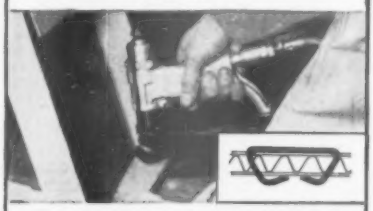
426—Industrial Exhausters. Bulletin F1-110 gives complete facts and application data. Buffalo Forge Co.

427—Plant Sites. Free pamphlets outline plant location advantages. Pennsylvania Dept. of Commerce.

Learn how
DUO-FAST
can save you money



DUO-FAST Gun Tacker makes short work of attaching tags and labels to wooden boxes, etc.



DUO-FAST Air Plier speeds stapling of special cartons, corrugated filler, bags, etc. Powerful, yet portable.

DUO-FAST Hammer Tacker — fastest, easiest method of applying protective pads, boxcar linings, etc.

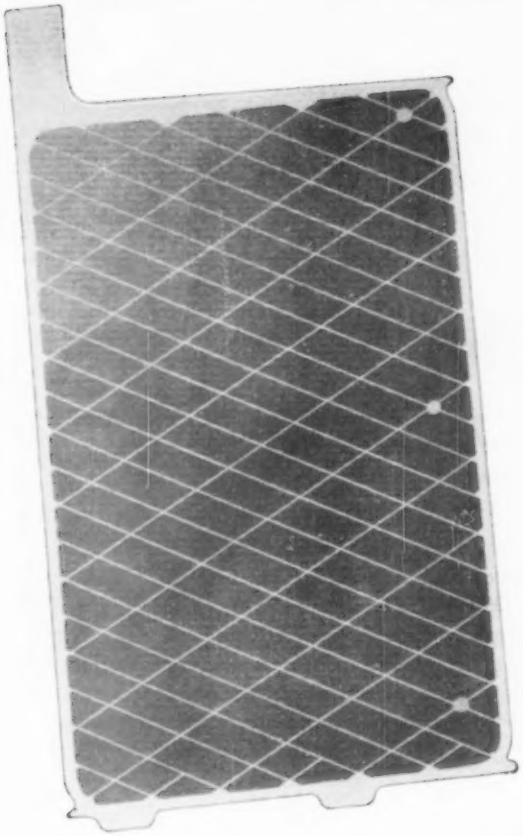
DUO-FAST Outward-Clinch Stapler solves the problem of attaching labels to filled cartons. No anvil needed.

FREE: Send for Bulletin FT-50. Find out how DUO-FAST Staplers and Tackers can speed and simplify *your* fastening jobs. And remember—DUO-FAST tools are backed by our FREE SERVICE GUARANTEE. Why settle for less?

FASTENER CORPORATION
3758-66 River Rd., Franklin Park, Ill.

DUO-FAST
Staplers · Tackers · Staples

NEW GOULD *SILCONIC* PLATE Increases Battery Life 25%-FREE!



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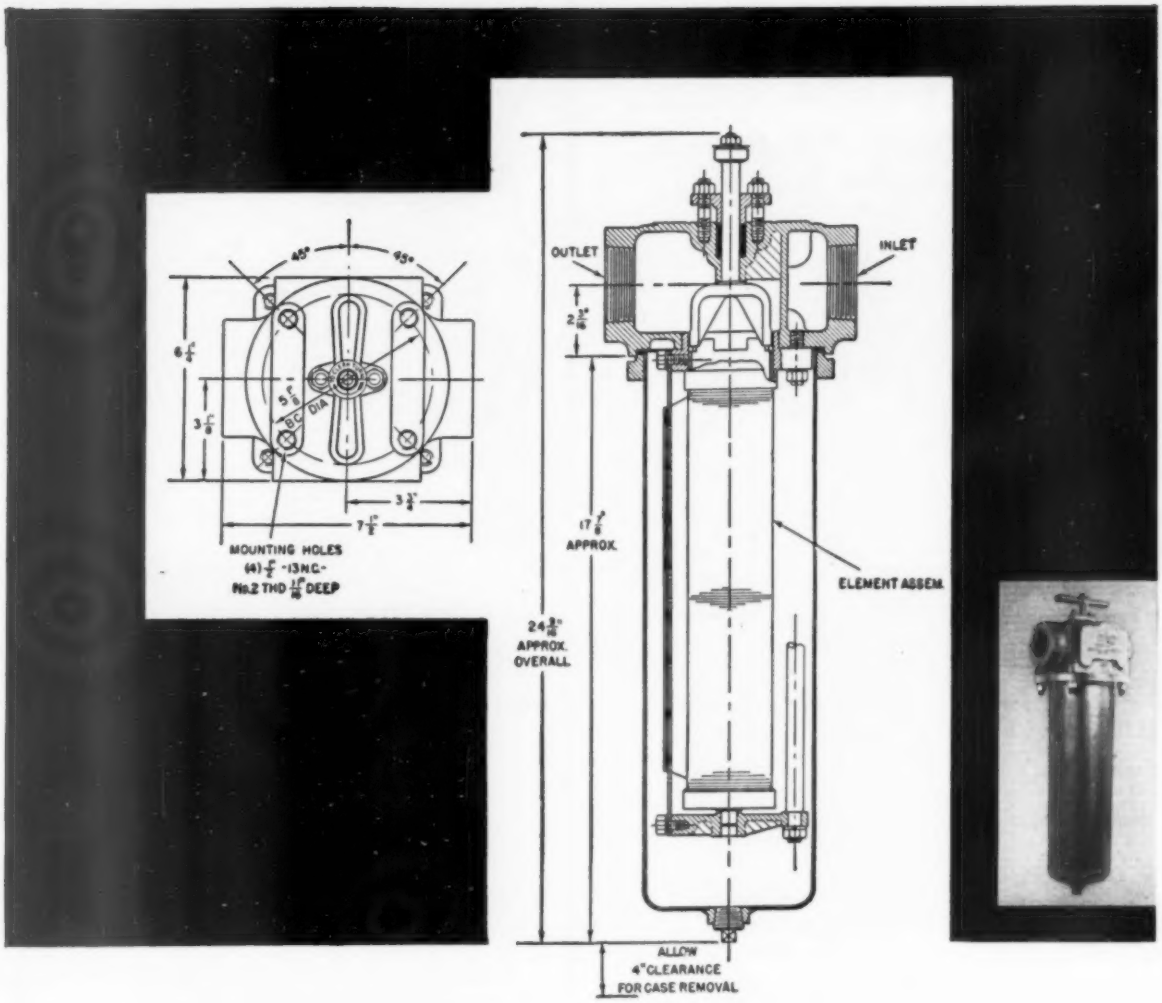

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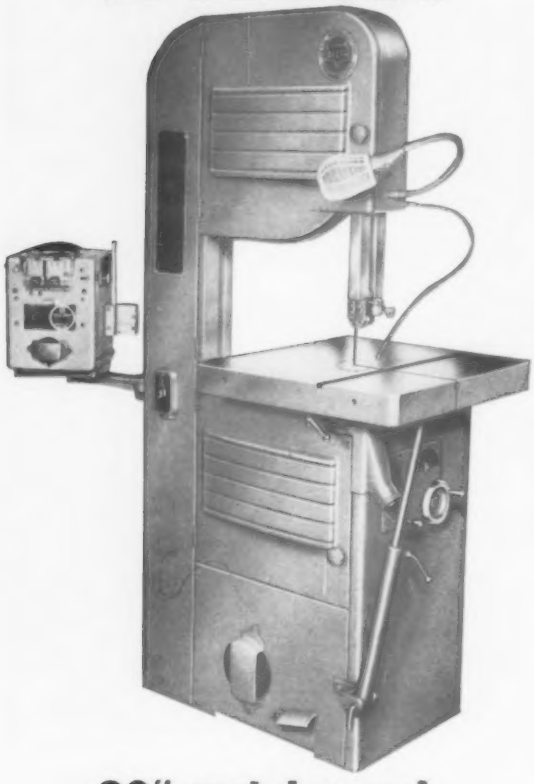

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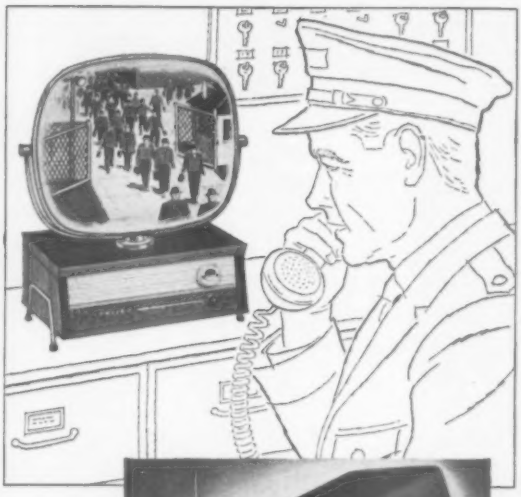

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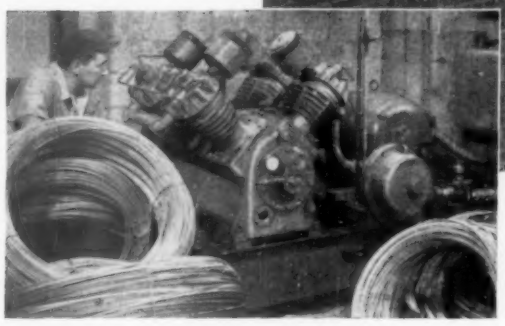

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The CASE of the DOUBLE ALARM

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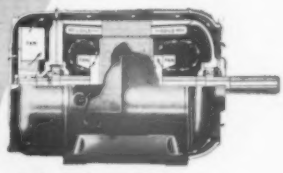

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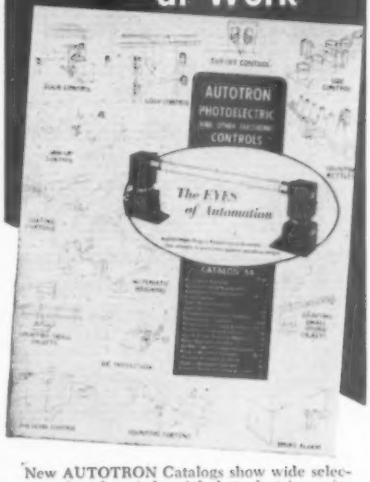

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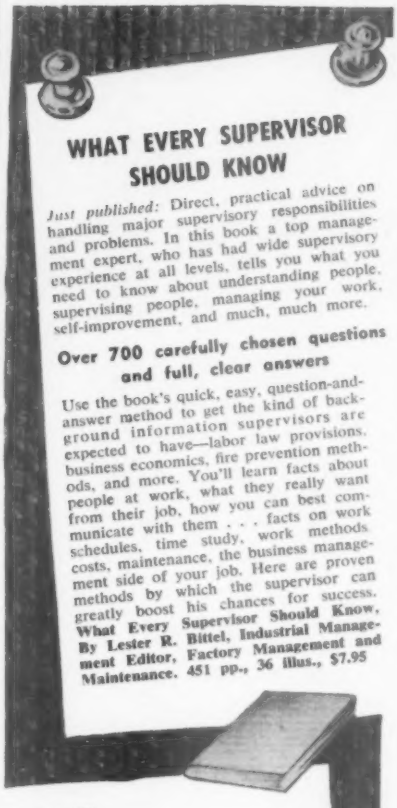

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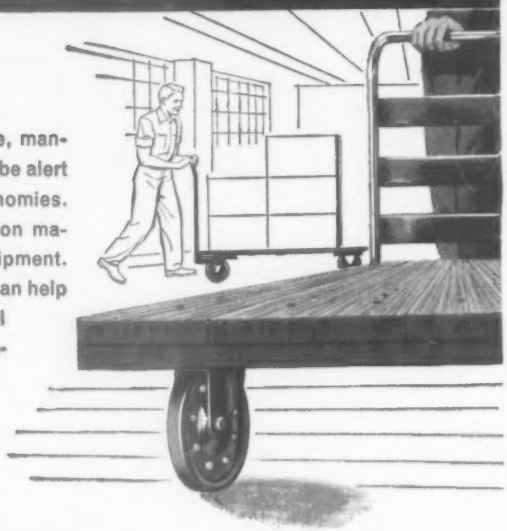

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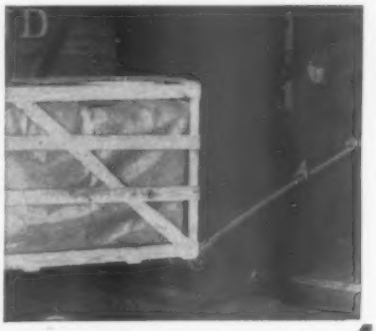

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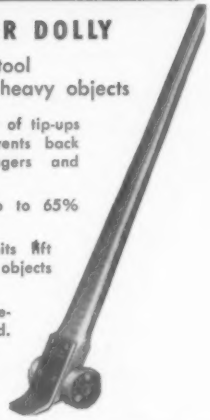

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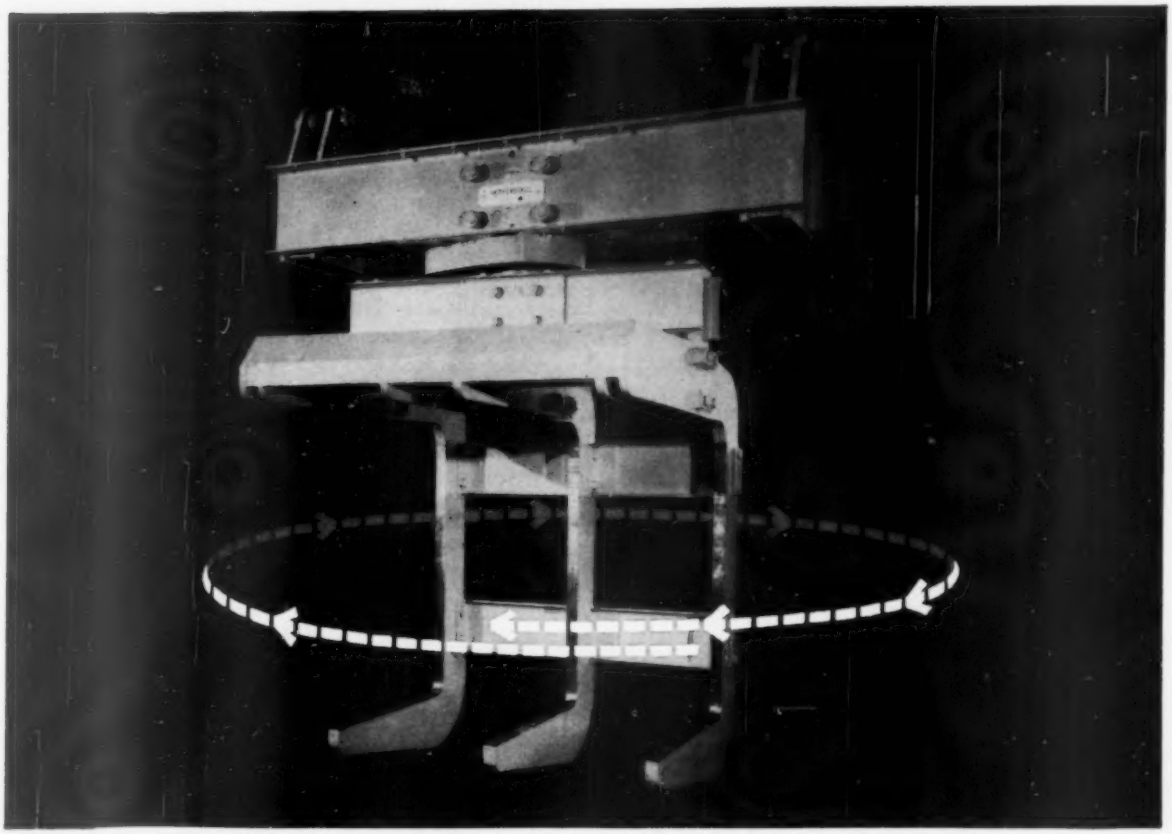

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Mr. Thomas Bender, *Classified Advertising Division*
McGRAW-HILL PUBLISHING COMPANY, INC.
P.O. Box 12 New York 36, New York

SLASH DAILY SWEEPING COSTS
Sweep in-plant and out . . . FAST!

Parker FLOOR SWEEPERS

MAINTENANCE SWEEPER

TURBO SWEEP . . . Dust-free sweeping at low cost. Sweeps 50,000 ft. per hr.

MOTORIZED . . . Quick, efficient cleaning for large areas. 20" and 28".

MAIL NOW!

PARKER SWEEPER CO., Dept. No. F
Springfield, Ohio

Send me free booklet and give me money-saving facts!

Name_____
Company_____
Address_____
City_____ State_____

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE

The advertising rate is $27.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

EMPLOYMENT OPPORTUNITIES—$37.40 per inch subject to agency commission.

INFORMATION:

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

An ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page.

UNDISPLAYED RATE

(Not available for Equipment Advertising $2.40 a line. Minimum 3 lines. To figure advance payment count 5 average words as a line. (See ¶ on Box Numbers.)

POSITION WANTED undisplayed rate is one half of above rate, payable in advance.

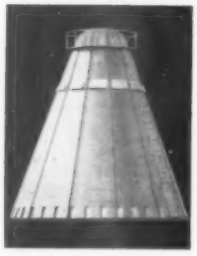
BOX NUMBERS count as one additional line.

Send New ADS or Inquiries to Class. Adv. of Factory, P. O. Box 12, New York 36, N. Y., for July Issue Closing June 15.

WHERE TO BUY

Featuring additional products, specialties & services for manufacturing plants

WILCO REFUSE BURNER



Gets Rid of
Waste and Trash
at Lowest Cost

Write Dept. F-1

Wilco Machine Works, Inc.

P.O. Box 3722,
Memphis 14, Tenn.
WHitehall 8-4555

CAN YOUR PRODUCT

Cut costs, boost production or increase plant efficiency? If so, say so in this Where-to-Buy section. Then you'll have your prospective customers—the 63,322 paid subscribers to this plant operator's magazine—coming to you.

WANTED TO BUY:

Late model "L" or "Y" type two stage
AIR COMPRESSOR
100 to 150 HP — Write full particulars to
W-1652 FACTORY
520 N. Michigan Ave., Chicago 11, Ill.

ADDRESS BOX NO. REPLIES TO: Box No. 43093
Classified Adv. Div. of this publication.
Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITION VACANT

Wanted: Can Plant Superintendent, Food Manufacturer with National distribution wants young man to assume responsibility for all phases of operation of can manufacturing plant. Must have some experience in sanitary can assembly and press department operation, supervision of operating personnel, and understanding of quality standards and inspection procedures. Send resume of experience and salary requirements in first reply. All replies held confidential. P-1572, Factory.

POSITION WANTED

Doctor industrial engineer, Italian, wide experience mechanical factories management,—production, organization, designing, sales—, wants proposal (f.e: management, experimented patents development, making leave, agencies etc.), for Italy. PW-1262, Factory.

SPECIAL SERVICE

Time Study Boards with transparent watch holders, stop watches, Pedometers, Slide Rules, Forms in stock. Sample kit free. Oznam Products Co., 5544 S. Homan Ave., Chicago 29.

DIE CAST SUPERINTENDENT TOOL ROOM FOREMAN

The man I am looking for must have a background of practical experience and a record of accomplishments in Zinc and Aluminum Die Casting. He must be able to take complete charge of a high volume well established multi shift midwest operation. This man must also have a firm conviction of his own capabilities and must have the initiative and intestinal fortitude to back up these convictions with successful accomplishments.

This is a golden opportunity for the right man. Remuneration will be in accordance with ability and accomplishment. Retirement and Insurance benefits are among the best in the industry. If your qualifications meet our requirements send complete resume.

We also require an experienced and qualified Foreman for building new tools, the follow through and development of these tools in production and the maintenance throughout model production runs.

P-1651—FACTORY
520 N. Michigan Ave., Chicago 11, Ill.

MANAGEMENT INDUSTRIAL ENGINEER

If you are interested in a challenging, stimulating opportunity to broaden your base of experience and contribute to the solving of varied and interesting business problems, this Chicago-based management consulting firm (member ACME) would like to consider your complete background resume in confidence. Your experience should be in incentives, time study, methods, plant layout, and work of a related nature at a supervisory level. Production experience also would be extremely helpful. At age 35-45, you should be a Chief Industrial Engineer or Plant Manager now, or an Assistant in a large company, and be able to quickly handle complex assignments with a minimum of direction. An engineering degree is desired. Commensurate salary and bonus, with progress limited only by your own growth potential. You will be home weekends whenever travel is involved.

P-1779 Factory
520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL CONSULTANTS

DRAKE, STARTZMAN, SHEAHAN and BARCLAY
Distribution and Materials Handling Consultants
"Control, Movement and Storage of Materials"
41 East 42nd Street — New York 17, N. Y.

JOHN B. HARJU and ASSOCIATES
Industrial Consultants
• Operations Analysis • Materials Handling • Plant Layout and Associated Engineering Services incident to New Plants Planning, Methods Improvement, Operations Relocation and/or Consolidation and Plant Rearrangement Programs.
1940 Hyland Avenue — Ferndale, Michigan

GEMAR ASSOCIATES
CONSULTING
MATERIALS HANDLING
ENGINEERS
over 25 years experience
Greenwich, Connecticut

METHODS ENGINEERING COUNCIL
H. B. MAYNARD, President
Consultants in Industrial Management
718 Wallace Ave.—Pittsburgh 21, Pa.

PLANT & FACILITIES ENGINEER

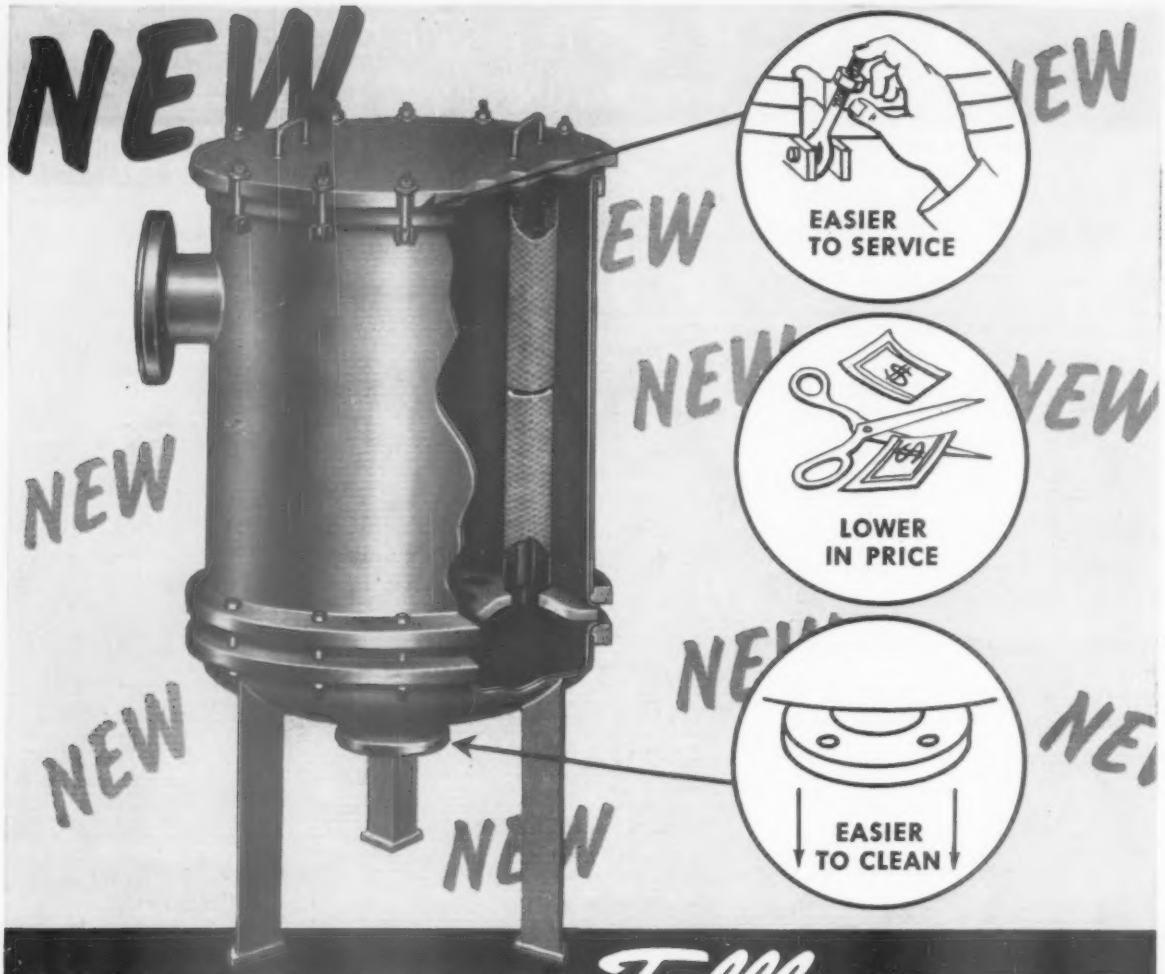
New plant of old line manufacturer offers real challenge and unusual job satisfaction to ambitious and able plant engineer. Starting salary $10,00 to $12,000. Agency fee & relocation expenses assumed by company.

MONARCH PERSONNEL
22 East Jackson Blvd., Chicago, Illinois

JOBBERS WANTED

We manufacture Kob-Kleen (ground corn cobs) for deburring, burnishing, polishing and soft grit blasting of metals; metal stamping absorbents, etc. Nationally advertised.

COEVAL, INC.
Dept. G, St. Joseph, Illinois



"SWING-BOLT" *Fulflo* FILTER CUTS YOUR PLATING COSTS

Now . . . the new Fulflo Rubber-Lined Steel Filter for plating cuts your filter maintenance costs in half, while providing tank turnover up to 3 times per hour.

New swing-bolt cover simplifies and speeds up changing elements. Just loosen the bolts, swing them out of the way, and lift off the cover to provide complete access to the patented Honeycomb Filter Tubes. Tubes are completely changed in a matter of minutes.

New bottom outlet allows for quick, easy cleaning of entire vessel simply by addition of a "T" connection with drain valve. You save time and labor.

Best of all, new engineering and production refinements enable us to offer this filter at an even lower price than the previous model.

The new Fulflo Rubber-Lined Steel Filter is offered in six sizes, with from 6 to 60 Honeycomb Filter Tubes, for capacities up to 18,000 gph. Steel or stainless steel containers are also available.

It will pay you to look into this new Fulflo Filter to improve plating quality at lower cost.

For qualified engineering advice, or new technical literature, write to Department FA.

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

MICRO-CLARITY AT MINIMUM COST

Fulflo FILTERS — *with genuine Honeycomb Filter Tubes for controlled micro-clarity of industrial fluids.*

CFC FILTERS — *Selective filtration of oils • water-oil separators • magnetic separators • pre-coat filters • coolant clarifiers • automatic tubular conveyors.*

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SEARCHLIGHT SECTION
(Classified Advertising)
F. J. Eberle, Business Mgr.

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Employment Opportunities 277

ROSS
Air Systems

Engineered Atmospheres for Better Processing

6

MODERNIZATION WILL PAY OFF!

Automatic Controls

Modern Dryers and Ovens

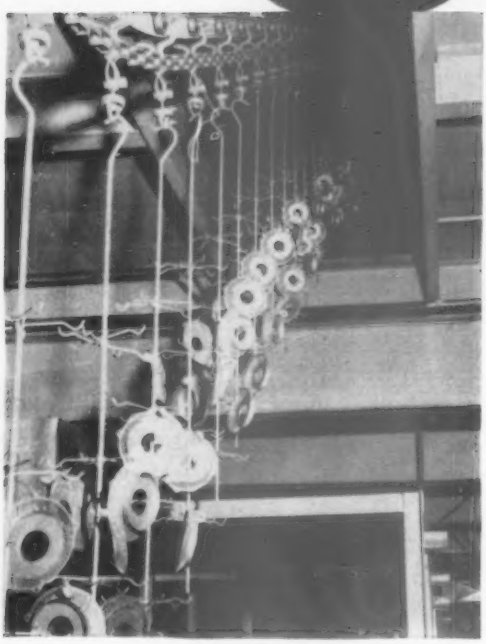
Paint Application Methods

Better Application of Air

More Efficient Heater and Fans

Revamp to Accommodate New Formulations

Broad Targets for Modernizing Your Paint Finishing Section



Considering your paint finishing department as a whole there are several operations where modernization by means of the modern Ross Unit or System might pay off quickly in operational savings: dryer, oven, controls, automation, fans, conveyors, hook-loads, travel cycles...all of which are included in the broad list above.

Any unit that has been in service, say, five years or more is approaching obsolescence, if not already in that cost-hiking state. It places a burden on your competitive situation...a burden that viciously pyramids.

Why not ask a Ross Paint Finishing Specialist to study your layout and report back? He'll be glad to do it. And he has the broad paint finishing experience to do an intelligent, objective job. A phone call or letter to our nearest office will have him there shortly.

M-R MIDLAND-ROSS

THE MIDLAND-ROSS GROUP OF COMPLEMENTING SERVICES

J. O. Ross Engineering, New York
John Waldron Corporation, New Brunswick, N. J.
Andrews and Goodrich, Boston
Ross Engineering of Canada Limited, Montreal
Ross Midwest Fulton, Dayton
Hartig Extruders, Mountainside, N. J.
Carrier-Ross Engineering Company, Ltd., England

J. O. ROSS ENGINEERING
Division of Midland-Ross Corporation

730 Third Avenue, New York 17, N. Y.
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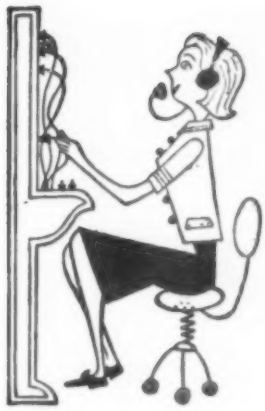

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Better Make-or-Buy Decisions. There's too much at stake these days to risk hit-or-miss figuring. Here's how to smarten up your decisions, help your company, and become a hero yourself. **FC-19.**

How to Talk—and Listen—Better. You've got to do both—and do them well—to communicate effectively. Here are tips from a plant man who has made an art of plain talk and smart listening. **FC-34.**

How a Pro Sees Maintenance Cost Reduction. Carl Wyder, FACTORY's ranking maintenance expert, shoots straight from the hip as he attacks this familiar but too often neglected problem. **FC-35.**

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428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445											
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750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771							
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Catalogs in This Issue

To help you, here is a list of catalogs described in this issue. To obtain, circle key numbers on either postcard.

MECHANICAL
1—Conveyor Drives
2—V-Belt Fasteners
3—Bearing Units
4—Sprockets
5—Speed Reducers
6—Electro-Sheaves
7—Valves
8—Pipes
9—Seal Valves
10—Valves

MAINTENANCE
11—Seals
12—Maintenance Equipment
13—Industrial Monkey
14—Gaskets
15—Fire Extinguishers

PRODUCTION
16—Auto-Tracer Lathes
17—Milling Control System
18—Electric Tool
19—Gages
20—Welding Positioners
21—Instantaneous Heating
22—Chucks
23—Unit Tooling
24—Spindle Machines
25—Tracer Control

MATERIALS HANDLING
26—Materials Handling Equipment
27—Conveyor Belt Splice
28—Electric Trucks
29—Hoists
30—Materials Handling Systems
31—Trucks, Casters
32—Pneumatic Conveying System
33—Automatic Packaging
34—Materials Handling Techniques
35—Weight Recording
36—Packaging Guide
37—Crane Equipment

INSTRUMENTS AND CONTROLS
38—Instruments for Rent
39—Magnetic Tape Recorders
40—Level and Flow Controls

AIR HANDLING
41—Truck Air Conditioning
42—Air Cleaners
43—Air Diffusion Equipment
44—Air Cleaner
45—Dehumidifiers
46—Induced Draft Fans

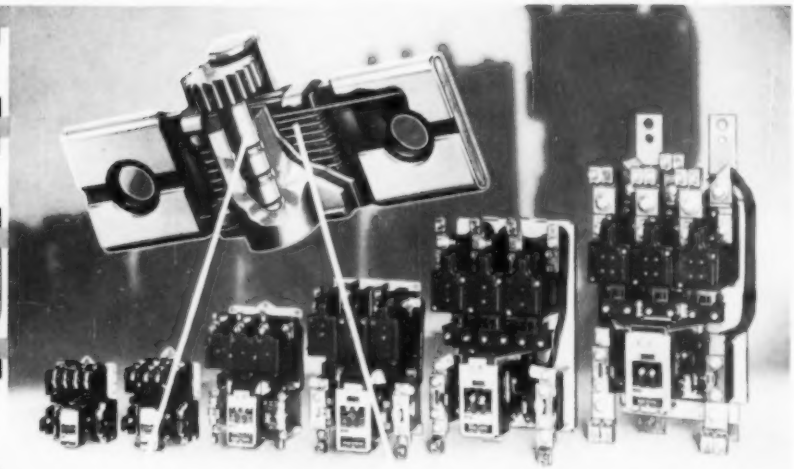
ELECTRICAL
47—Conduits
48—Speed Drive Equipment
49—Adjustable Speed Drive
50—Helical Gear-Motors
51—Circuit Breaker Control
52—Distribution Equipment
53—Conduit, Fittings

MISCELLANEOUS
54—Elevated Flooring
55—Rolling Steel Doors
56—Setting Floor Brick
57—Rolling Doors
58—Record Files
59—Dictating-Transcribing Machine
60—Computers
61—Drafting Equipment
62—Adhesive Equipment
63—Loudspeaker Baffles
64—Data-Gathering System

When you buy Motor Starters – –

YOU PAY FOR OVERLOAD PROTECTION

...BE SURE YOU GET IT!



Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Only ONE-PIECE Overload Relays can give 100% Protection Only with ONE-PIECE construction can you *know* you've installed the heater correctly. Only with ONE-PIECE construction can you *know* the heater is exactly centered, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you *know* your starters will not operate without the thermal units properly installed. Only with ONE-PIECE construction can you *know* your motors have full protection.

Only Square D has ONE-PIECE Construction ONE-PIECE construction *eliminates* any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamper-proof. They are factory-assembled, are *individually* calibrated and tested. Repeated tripping will not affect their accuracy.

Insist on Square D starters with melting alloy thermal overload relays

LET US PROVE IT!

Let your Square D Field Engineer show you **1** how one-piece construction is accomplished and how easy it is to mismatch separate heaters and solder pots— **2** an endurance tester to prove that overload units can be reset repeatedly without damage while the solder is liquid— **3** a tripping time tester to compare various types of melting alloy units and to prove that tripping time won't change after repeated operation.

***Write** for Bulletin SM-275 for the complete story on Square D starters with ONE-PIECE thermal overload relays. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin*

SQUARE D COMPANY

For more facts circle 447 on READER SERVICE CARD

INTRODUCING AN ALL ELECTRIC, VARIABLE SPEED DRIVE FOR UNDER $220.* THE FRACTIONAL hp. V★S Jr.

Now you can gain the efficiency of stepless speed changes for smaller machines. The new fractional V★S Jr. puts complete machine control at your operator's fingertips, for less than $220.*

The fractional V★S Jr. will vary drive motors speeds from 215 thru 1725 rpm. Speeds can be changed through this 8:1 range by a simple turn of the selector dial. Speed changes can be made while the machine is operating or pre-selected before starting.

This packaged drive provides start, stop and stepless speed changes from in-plant a-c. power. Jog, reverse, and braking functions are available for more flexibility. The fractional V★S Jr. is available from ⅛ thru ¾ hp. in all enclosures with standard or gearmotor, and is a new addition to the integral V★S Jr. line, 1 thru 4 hp.

For complete details contact your local Reliance Representative or write for Bulletin D-2507.

*⅛ hp. drive complete with motor, controls, and operators panel.

Product of the Reliance Electric and Engineering Company, manufacturers of a-c. motors, Master Gearmotors, V★S Drives, Super 'T' D-c. Motors, generators, controls and engineered drive systems. D-1624

RELIANCE ELECTRIC AND ENGINEERING CO.

DEPT. 556A, CLEVELAND 17, OHIO
Canadian Division: Toronto, Ontario
Sales Offices and Distributors in principal cities

MASTER REEVES

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